

C8. Preliminary Geotechnical Investigation Report



PRELIMINARY GEOTECHNICAL INVESTIGATION **DIXIE ROAD (REGIONAL ROAD 4)** QUEEN STREET TO 2.1 km NORTH OF MAYFIELD ROAD **REGION OF PEEL, ONTARIO**

Prepared for:

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1. INTRODUCTION

Terraprobe Inc. was retained by AECOM to provide geotechnical design information for the proposed improvements to Dixie Road from Queen Street to approximately 2.1 km north of Mayfield Road in the Region of Peel, Ontario. A site location plan is provided as Figure 1 and site photos are presented as Figures 2A and 2B.

Initially, the south and north project limits were Queen Street and Mayfield Road respectively and Terraprobe previously completed geotechnical work for this portion of the assignment. Reference is made to the following geotechnical report.

 Terraprobe Limited "Draft Preliminary Geotechnical Investigation, Dixie Road (Regional Road 4), Queen Street to Mayfield Road, Region of Peel, Ontario," File No. 1-08-3219, dated June 23, 2009.

The north project limit was subsequently extended to about 2.1 km north of Mayfield Road and this report provides geotechnical design information for the revised project limits. The purpose of this investigation was to determine the subsurface conditions along the alignment and to provide preliminary geotechnical design recommendations to support a Schedule "C" Class Environmental Assessment Study.

2. PROJECT AND SITE DESCRIPTION

Dixie Road is a north-south oriented four-lane roadway that generally conforms to an urban cross-section between Queen Street and Countryside Drive. From Countryside Drive to the north project limit the roadway narrows to a two lane rural cross-section. The roadway is approximately 9,265 m long within the project limits and intersects Queen Street, Howden Boulevard, Williams Parkway, Northampton Street, North Park Drive, Bovaird Drive, Peter Robertson Boulevard, Sandalwood Parkway, Countryside Drive and Mayfield Road.

Two significant culverts cross Dixie Road within the project limits. The first culvert is a 29 m long concrete box culvert located approximately 300 m north of Queen Street. The second culvert is approximately 30 m in length and is located about 1,400 m north of the Dixie Road/Mayfield Road intersection. A large storm water facility is located at the north east corner of the intersection of Dixie Road and Bovaird Drive.

We understand that a phased implementation plan is being proposed for the ultimate 6-lane widening of Dixie Road from Queen Street to 2.1 km north of Mayfield Road.



3. FIELD PROCEDURE

A visual pavement condition survey was conducted in May 2009 to evaluate the condition of the existing pavement from Queen Street to Mayfield Road and the roadway extending from Mayfield Road to the north project limit was evaluated in August 2010. The initial field investigation from Queen Street to Mayfield Road was conducted during the period of October 09 to 15, 2008. Additional field investigations were undertaken on July 28, 2010 for the section extending from Mayfield Road to the north project limit.

A total of forty-seven boreholes were drilled and sampled to depths ranging from 0.6 m to 9.6 m below ground surface. Boreholes 21 and 31 were not drilled due to conflicting utilities. The pavement was also cored at seven selected locations. The boreholes and coreholes were located in the field by Terraprobe Inc. in relation to existing features and their approximate locations are shown in Figures 3A to 3H.

Boreholes extended through the existing roadways were drilled with a truck mounted drill rig supplied and operated by Drilltech Drilling Ltd. of Newmarket, Ontario and Groundwork Drilling Inc. of Etobicoke, Ontario. Boreholes were also extended in the boulevard areas by advancing a split-spoon sampler with portable hand operated vibratory equipment (Pionjar).

Where conventional drilling equipment was used to drill the boreholes, representative samples of the strata penetrated were obtained from the boreholes, using a split-barrel sampler advanced by a 63.5 kg hammer dropping approximately 760 mm. The results of these Penetration Tests are reported as "N" values on the borehole logs at corresponding depths.

Members of Terraprobe's technical staff observed the coring, drilling, sampling and in-situ testing operations on a full time basis. Samples obtained from the boreholes were inspected in the field, sealed in clean plastic containers and transferred to Terraprobe's laboratory for further visual examination by a geotechnical engineer. Geotechnical laboratory testing consisted of water content determination on all samples and grain size analyses and Atterberg Limits tests on selected samples. The asphalt cores were transported to Terraprobe's laboratory for visual examination, measurement and photography. The results of the boreholes are presented in Appendix A.

Water level observations were made in the open boreholes during and immediately after completing the drilling operations. Borehole 34 was instrumented with a standpipe piezometer to permit longer term ground water level monitoring.

The ground surface elevation of Borehole 34 was referred to the City of Brampton benchmark I3-410 located on the west side of this culvert 144 m north of Hillside Drive. The elevation of this benchmark is 217.35 m. The ground surface elevation of Borehole 10-5 was referred to a temporary benchmark established on the top north-east corner of the existing concrete culvert located at approximately Sta. 16+420. A value of 100.0 m was assigned to this TBM.

4. SUBSURFACE CONDITIONS

Reference is made to the Log of Borehole sheets in Appendix A for details on the encountered soil stratigraphy. An overall description of the stratigraphy is given in the following paragraphs under three sections viz. Pavement Structure and Shoulders and the two Culvert Sites. However, the factual data presented in the Log of Borehole Sheets governs any interpretation of the site conditions. The subsurface conditions were confirmed at the borehole locations only and conditions may vary between and beyond.

4.1 Pavement Structure and Shoulders

The pavement structure of Dixie Road and the intersecting sideroads are tabulated below. Pavement core data and photographs are included in Appendix C.

Dixie Road f	from Sta. 7+800 to Sta. 14+150		
Pavement Component	Typical Average Pavement Thickness (mm)		
	Main Lanes		
Asphalt	150		
Granular Base/Subbase	470		
Total Average Pavement Thickness	620		

Dixie Road from Sta. 14+150 to Sta. 15+000					
Pavement Component	Typical Average Pavement Thickness (mm				
	Main Lanes	Shoulders			
Asphalt	155	1 = ,			
Granular Base/Subbase	610	655			
Total Average Pavement Thickness	765	655			



Dixie Road from Sta. 15+000 to Sta. 17+050					
Pavement Component	Pavement Component Typical Average Pavement Thickness (mm				
	Main Lanes	Shoulders			
Asphalt	140	: -			
Granular Base/Subbase	700	755			
Total Average Pavement Thickness	840	755			

Pavement Component	Main Lanes - Typical Average Pavement Thickness (mm)					
	Mayfield Rd. (East Leg)	Countryside Drv. (West Leg)	Sandalwood (East Leg)	Peter Roberston (East Leg)		
Asphalt	260	165	110	115		
Granular Base/Subbase	550	470	470	365		
Total Average Pavement Thickness	810	635	580	480		

Pavement Component	Main Lanes - Typical Average Pavement Thicknes					
	Bovaird Drv. (East Leg)	North Park Drv. (East Leg)	Williams Pky. (West Leg)	Howden Blvd. (East Leg)		
Asphalt	140	140	135	140		
Granular Base/Subbase	620	320	325	660		
Total Average Pavement Thickness	760	460	460	800		

Gradation analyses were conducted on seven samples of the granular fill comprising the pavement structure of Dixie Road and the results are referenced to OPSS Granular A and Granular B Type I specifications. These results are illustrated in Figure B1 in Appendix B.

The granular fill is in a compact to very dense state based on SPT "N" values that ranged from 12 to 84 blows for 0.3 m penetration. The moisture content of this fill ranged from 1% to 6% by weight.

4.1.1 Topsoil

Topsoil ranging from 20 mm to 250 mm in thickness was encountered within the project limits. Topsoil thickness will vary between and beyond boreholes.



4.1.2 Fill - Silty Clay

Silty clay fill material was encountered extending to depths ranging from 0.6 m to 2.4 m below ground surface. Laboratory test results (grain size analysis and Atterberg Limits tests) of samples of this fill material are illustrated in Figures B2 and B3, Appendix B.

Standard Penetration Tests conducted in this fill material gave "N" values ranging from 8 to 28 blows for 0.3 m penetration and pocket penetrometer tests on relatively undisturbed samples gave undrained shear strengths ranging from 150 kPa to 175 kPa. Based on these results the fill is considered to have a stiff to very stiff consistency. The moisture content of samples of this fill ranged from 7% to 33% by weight.

4.1.3 Fill - Sand and Silt

Sand and silt fill was encountered in Borehole 14 extending to a depth of 1.2 m below ground surface. The grain size distribution curve of a sample of this soil is illustrated in Figure B4, Appendix B. The moisture content of a sample of the fill was 9% by weight.

4.1.4 Fill - Sand and Gravel

Granular fill material ranging from sand, to sand and gravel was encountered within the project limits extending to depths ranging from 0.6 m to 3.7 m below ground surface. This fill is in a compact to very dense state based on SPT "N" values that ranged from 12 to 84 blows for 0.3 m penetration. The moisture content of samples of this fill ranged from 3% to 9% by weight.

4.1.5 Silty Clay to Clayey Silt Till

Silty clay to clayey silt till was encountered within the project limits extending to depths ranging from 1.3 m to 2.4 m in the shallow pavement boreholes and to a termination depth of 9.6 m in Borehole 10-5. Till soils can be expected to contain cobbles and boulders. Laboratory test results (grain size analysis and Atterberg Limits tests) of samples of the silty clay to clayey silt till are presented in Figures B5 and B6 respectively, Appendix B.

Standard Penetration tests performed in this deposit yielded "N" values ranging from 6 to more than 50 blows for 0.3 m penetration and pocket penetrometer tests conducted on relatively undisturbed samples of this deposit gave undrained shear strengths ranging from 135 kPa to more than 225 kPa. Based on these results

the silty clay to clayey silt till is considered to have a generally stiff to hard consistency with occasional firm zones. The moisture content of samples of the till ranged from 6% to 20% by weight.

4.1.6 Sands & Silts

Deposits of sands and silts were encountered in some of the boreholes. These deposits extend to depths ranging from 1.5 m to 1.8 m below ground surface. Refer to Figure B7, Appendix B for the grain size distribution curves of samples from these deposits.

A Standard Penetration test performed in this deposit yielded an "N" value of 47 blows for 0.3 m penetration indicating a dense relative density. The moisture content of samples of the soils ranged from 10% to 19% by weight.

4.2 Culvert Site (Sta. 7+900)

Borehole 34 was extended at this site and encountered a 200 mm thick surficial layer of topsoil. Topsoil thickness will vary beyond and between boreholes.

The topsoil is underlain by a layer of silty clay fill that extends to a depth of 2.9 m below ground surface. The silty clay fill is considered to have a stiff to very stiff consistency based on SPT "N" values that ranged from 8 blows to 19 blows for 0.3 m penetration. The moisture content of samples of this fill ranged from 13% to 17% by weight.

The silty clay fill is further underlain by a native deposit of sand and silt till that extends to a depth of 6.9 m below ground surface. The grain size distribution curve of a sample of this till is illustrated in Figure B8, Appendix B. Random cobble and boulder inclusions can also be expected to occur in till soils.

The sand and silt till is considered to have a very dense relative density based on SPT "N" values that ranged from 58 blows to more than 50 blows for 0.3 m penetration. The moisture content of samples of the sand and silt till ranged from 6% to 14% by weight.

At this site a native deposit of sand and gravel was encountered extending to the borehole termination depth (7.7 m). A Standard Penetration test conducted in this sand and gravel deposit gave an "N" value of more than 50 blows for 0.3 m penetration indicating a very dense relative density. The moisture content of a sample of this soil was 7% by weight.

4.3 Culvert Site (Sta. 16+420)

Borehole 10-5 was extended through the existing pavement at this site and encountered a 125 mm thick layer of asphalt.

The asphalt is underlain by sand and gravel fill that extends to a depth of 3.7 m below ground surface. This fill is considered to have a compact to very dense relative density based on SPT "N" values that ranged from 17 blows to in excess of 50 blows for 0.3 m penetration. The moisture content of samples of this fill ranged from 4% to 6% by weight.

At this site the sand and gravel fill is further underlain by a native deposit of silty clay to clayey silt till that extends to a borehole termination depth of 9.6 m and possibly beyond. The grain size distribution curve of samples of this till are illustrated in Figure B5 and the results of an Atterberg Limits test are plotted on the plasticity chart Figure B6, Appendix B. Random cobble and boulder inclusions can also be expected to occur in till soils.

The silty clay till is generally considered to have a firm to hard consistency based on SPT "N" values that ranged from 6 blows to more than 68 blows for 0.3 m penetration. The moisture content of samples of the silty clay to clayey silt till ranged from 10% to 20% by weight.

4.4 Water Levels

Water level observations were made in each borehole during and after completion of drilling. All of the shallow pavement boreholes were open and dry after drilling was complete. A wet cave was experienced in Borehole 10-5 at a depth of 3.7 m upon completion of drilling.

Borehole 34 was instrumented with a standpipe piezometer and water level measurements were made on separate visits after the field investigation. The water level readings are presented in the following table.

Water Levels

Landon	Danahala	D-1-	Water Levels		
Location	Borehole	Date -	Depth (m)	Elevation (m)	
Culvert Site at Sta. 7+900	34	November 19, 2008 December 01, 2008	2.7 2.6	215.0 215.1	



Based on these observations, it is our opinion that the ground water level at the culvert site (Sta. 7+900) is estimated to be at Elev. \pm 215 m. The ground water level at the culvert site (Sta. 16+420) is estimated to be approximately \pm 3.5 m below ground surface based on our review of the moisture content of the retrieved samples.

Perched water can also be expected to occur where relatively permeable layers of soil are underlain by more impermeable clayey silt and silty clay layers. The ground water level is subject to seasonal variations and will also be influenced by the free water level in the watercourses as well as by weather events.

5. DISCUSSION AND RECOMMENDATIONS

5.1 General

The following preliminary discussion and recommendations are based on the data obtained from this investigation and are intended for use by the owner and the design engineer. Further investigations will be required to support detail design.

This report is provided based on the terms of reference and on the assumption that the design features relevant to the geotechnical analyses will be in accordance with applicable codes, standards and guidelines of practice. If there are any changes to the site development features, or there is any additional information relevant to the interpretations made of the subsurface information with respect to the geotechnical analyses or other recommendations, then Terraprobe should be retained to review the implications of these changes with respect to the contents of this report.

5.2 Foundations

5.2.1 Culverts At Sta. 7+900 and Sta. 16+420

Spread footings are the most feasible and practical alternative for supporting a culvert extension or replacement. The recommended founding depths and geotechnical resistances for spread footings founded on undisturbed competent natural soils at the two culvert sites are tabulated below.

Geotechnical Resistances at Borehole Location (Culvert at Sta. 7+900)

BH No.	Existing Ground Surface Elev. (m)	Highest (Bottom) of Footing Below Existing Ground Surface (m)	Highest (Bottom) of Footing Elevation (m)	Factored Geotechnical Resistance at U.L.S. (kPa)	Bearing Resistance at S.L.S. (kPa)	Subgrade Material
34	217.7	2.9	214.8	500	325	Sand and Silt Till *

^{*} Subgrade soils will be easily disturbed when wet. Working mat/skim coat of lean concrete to be poured on subgrade soils after inspection and approval by the geotechnical engineer.

Geotechnical Resistances at Borehole Location (Culvert at Sta. 16+420)

BH No.	Existing Ground Surface Elev. (m)	Highest (Bottom) of Footing Below Existing Ground Surface (m)	Highest (Bottom) of Footing Elevation (m)	Factored Geotechnical Resistance at U.L.S. (kPa)	Bearing Resistance at S.L.S. (kPa)	Subgrade Material
10-5	101.1*	4.6	96.5*	375	250	Silty Clay to Clayey Silt Till **

^{*} Elevations based on temporary benchmark (Elev.=100.00m) established on top north east corner of the existing culvert.

The geotechnical resistances quoted in the preceding table are for concentric, vertical loads only. For eccentric or inclined loading, the geotechnical resistance must be reduced as illustrated in the CHBDC Clause 6.7.3 and Clause 6.7.4. The SLS value quoted in the table corresponds to a settlement of up to 20 mm assuming that the founding soils will be undisturbed during construction.

The sliding resistance of mass concrete poured on the sand and silt till subgrade may be computed based on an ultimate coefficient of friction of 0.7. The sliding resistance of mass concrete poured on the silty clay to clayey silt subgrade may be computed based on an ultimate coefficient of friction of 0.5.

Passive earth pressure resistance is generally not considered as a resisting force against sliding for conventional structure design because a structure must deflect significantly to develop the full passive resistance.

Design frost protection for the general area is 1.2 m. Therefore a permanent soil cover of 1.2 m or its thermal equivalent is required for frost protection of foundations. Where rip-rap (rock fill) is used only one-half of the rock fill thickness should be assumed to be effective in providing frost protection.

A working mat or skim coat of lean concrete is required on all footing bases. Prior to placing foundation concrete, the foundation base must be cleaned of all deleterious materials such as organics, topsoil, fill, softened, disturbed or caved materials, and any standing water. If construction proceeds during freezing weather conditions, adequate temporary frost protection for the founding subgrade and concrete must be provided.

^{**} Working mat/skim coat of lean concrete to be poured on subgrade soils after inspection and approval by the geotechnical engineer.

5.2.2 Backfilling and Lateral Earth Pressures

Earth pressures acting on the structure should be computed in accordance with Clause 6.9 of the CHBDC but generally is given by the expression:

$$P = K[\gamma (h-h_w) + \gamma'h_w + q] + \gamma_w h_w$$

P = the horizontal pressure at depth, h(m),

h = depth to point of interest (m),

K = the earth pressure coefficient,

 $\mathbf{h}_{\mathbf{w}}$ = the depth below the ground water level (m),

y = the bulk unit weight of soil, (kN/m³),

y' = the submerged unit weight of soil, (i.e. $\gamma - 9.8 \text{ kN/m}^3$),

q = the complete surcharge loading (kPa).

Where drainage can be provided effectively to eliminate hydrostatic pressures on the wall acting in conjunction with the earth pressure, this equation can be simplified to:

$$P = K(yh + q)$$

The backfill to the culvert should be in accordance with OPSS 902 and granular backfill should be placed to the extents shown in OPSD 803.010 (concrete culvert). All granular backfill must meet the specifications of OPSS 1010.

Backfill behind culverts should consist of free draining granular materials. For fills below the groundwater level or immediately below the roadway, it is recommended that Granular A material be used. Where necessary, proper tapering should be provided. Free draining backfill material, weepholes, etc. should be provided in order to prevent hydrostatic pressures, as shown on OPSD 3101.150.

In accordance with Clause 6.9.3 of the CHBDC, a compaction surcharge should be added. The magnitude should be 12 kPa at the top of the fill decreasing to 0 kPa at a depth of 1.7 m for Granular B Type I or to a depth of 2.0 m for Granular A or Granular B Type II.

Compaction equipment to be used adjacent to retaining structures should be restricted in accordance with OPSS 501.06. The backfilling operation should be carried out simultaneously on both sides of the culvert and should be carried out in accordance with OPSS 902.

Earth pressure coefficients for backfill to the culverts and wing walls are dependent on the material used as backfill. Typical values are tabulated below.

Earth Pressure Coefficients

	Earth Pressure Coefficient (K)					
Wall Condition	OPSS Grant	nular A or ular B Type II : 22.8 kN/m³	OPSS Granular B Type I φ = 32°; γ = 21.2 kN/m³			
	Horizontal Surface Behind Wall	Sloping Surface Behind Wall (2H:1V)	Horizontal Surface Behind Wall	Sloping Surface Behind Wall (2H:1V)		
Active (Unrestrained Wall)	0.27	0.40*	0.30	0.48*		
At rest (Restrained Wall)	0.43	÷	0.47	æ.		

^{*} For Wing Walls

The factors in the table above are "ultimate" values and require certain movements for the respective conditions to be mobilized. The values to use in design can be estimated from Figure C6.9.1 (a) in the Commentary to the CHBDC, 2006.

5.2.3 Temporary Shoring Design

Temporary shoring may be required at the culvert sites and the shoring must be designed in accordance with Ontario regulations by a Professional Engineer experienced in this type of work. Shoring should be designed so that the lateral movement of any portion of the roadway protection system will not exceed the established criterion for the structure performance level. Performance Level 2, 25 mm maximum horizontal displacement is recommended.

The appropriate unfactored parameters to be used for temporary shoring design are tabulated below.

Culvert at Sta. 7+900						
Soil	ф	γ	K _a	K _o	K _p	
Fill - Silty Clay	30	18	0.33	0.5	3.0	
Sand and Silt Till	35	20	0.27	0.4	3.7	
Sand and Gravel	35	19	0.27	0.4	3.7	

Culvert at Sta. 16+420					
Soil	ф	γ	K _a	K _o	K _p
Fill - Sand and Gravel	30	19	0.33	0.5	3.0
Silty Clay to Clayey Silt Till	32	20	0.30	0.47	3.3

5.2.4 Excavations & Groundwater Control

Excavations must be carried out in accordance with the Occupational Health and Safety Act and Regulations for Construction Projects. Excavations at the culvert sites will be made through silty clay fill, sand and gravel fill, sand and silt till and silty clay to clayey silt till. These soils can be classified as follows:

- Fill material Type 3 soils above the water table and Type 4 soils below the water table.
- Sand and Silt Till Type 2 soil above the water table and Type 3 soil below the water table.
- Silty Clay to Clayey Silt Till Type 2 soil above the water table and Type 3 soil below the water table.

Where workers must enter excavations extending deeper than 1.2 m, the trench walls must be suitably sloped and/or braced in accordance with the Occupational Health and Safety Act and Regulations for Construction Projects.

The dewatering effort can be expected to increase with depth especially at the first culvert site (Sta. 7+900) where sand and silt till soils were encountered. Therefore, the depth of excavation should be minimized as much as possible. A suitable system that might be employed can include gravity drainage and pumping from strategically placed filtered sumps. The design of the unwatering system should be the Contractor's responsibility.

5.2.5 Erosion Protection

Erosion protection should be provided at the culvert inlet and outlet (including the slopes and sides). At the inlet area this could consist of a clay seal. The purpose of the clay seal is to ensure that water flow is channelled through the culvert and does not seep through the backfill around and underneath the structure. It should be ensured that the clay seal extends to cover all the granular backfill materials to prevent seepage through them. The clay seal should therefore be continuous and have a minimum compacted thickness of 0.6 m and should extend above the high water level. The clay seal should be protected by a layer of rip-rap. The material used for the clay seal should conform to the requirements stipulated in OPSS 1205.

Alternatively, concrete cut-off and head walls can be constructed to protect the granular backfill and prevent seepage around the culvert. Concrete cut-off and head walls can also be used to protect the granular fill around the culvert outlet against erosion. In this case, however, filtered erosion protection such as rip-rap should be provided along the channel and the sides beyond the concrete cut-off and head walls at the outlet.

Design of erosion protection schemes for the stream bed in the inlet and outlet areas will depend on hydrologic, hydraulic and/or other concerns. Typically, rip-rap protection should be provided to these areas. The rip-rap layer should cover all surfaces on the embankment slopes with which creek water is likely to be in contact.

All footings must be placed below the predicted scour depth i.e. 1.5 m below the river bed level for preliminary design purposes. This preliminary scour depth must be verified by a river engineer.

5.3 Pavement Condition

A visual pavement condition survey of Dixie Road from Queen Street to Mayfield Road was undertaken in May 2009. The pavement condition survey from Mayfield Road to 2.1 km north of Mayfield Road was conducted in August 2010. The survey was conducted in accordance with the procedures outlined in MTO's manual for Flexible Pavement Condition Rating - Guidelines for Municipalities (SP-022).

The pavement distress features noted for the evaluated pavement sections are summarized in the following table. The Pavement Condition Evaluation Forms are included in Appendix C.

Section	Overall Condition	General Distresses
Dixie Road Sta. 7+800 to Sta. 8+300	PCR = 70, RCR = 7 Good	 Intermittent slight potholes. Intermittent slight distortion and utility trenches. Frequent moderate longitudinal and transverse cracks. Frequent severe pavement edge breaks. Frequent slight map cracking. Intermittent moderate alligator cracking.
Dixie Road Sta. 8+300 to Sta. 9+500	PCR = 80, RCR = 8 Good	Intermittent slight distortion and utility trenches. Intermittent slight longitudinal and transverse cracks. Intermittent slight pavement edge breaks and map cracking.
Dixie Road Sta. 9+500 to Sta. 9+900	PCR = 75, RCR = 7 Good	Intermittent moderate potholes. Intermittent slight to moderate pavement edge breaks Intermittent slight distortion Frequent moderate longitudinal cracks Intermittent slight transverse cracks Intermittent slight map cracking.
Dixie Road Sta. 9+900 to Sta. 10+700	PCR = 75, RCR = 7 Good	 Intermittent slight potholes. Intermittent slight rippling and shoving and distortion. Frequent moderate longitudinal cracks. Intermittent slight pavement edge breaks, transverse and map cracking.
Dixie Road Sta. 10+700 to Sta. 13+750	PCR = 85, RCR = 8 Good	Intermittent slight potholes. Intermittent slight distortion, longitudinal and transverse cracks.
Dixie Road Sta. 13+750 to Sta. 15+000	PCR = 80, RCR = 8 Good	 Intermittent slight ravelling, potholes and pavement edge breaks. Intermittent slight transverse cracks, pavement edge breaks and map cracking. Frequent slight longitudinal cracks.
Dixie Road Sta. 15+000 to Sta. 17+064	PCR = 90, RCR = 9 Excellent	 Intermittent slight ravelling. Moderate distortion at Sta. 15+900 and Sta. 16+275 above existing CSP's.

5.4 Traffic Volumes and Pavement Design Parameters

The AADT values, annual growth rates and percentage of commercial vehicles used for the pavement design were provided by AECOM. This data is summarized as follows:

Bournant Books Bournatous	DIXIE ROAD Sta. 7+800 to Sta. 17+064		
Pavement Design Parameters			
AADT (2008)	22,778		
Projected Base Year AADT (2010)	24,400		
Projected AADT (Year 2025)	40,880		
Annual Growth Rate (2008 to 2025)	3.5%		
Percent Commercial Vehicles	5%		
Directional Split	50%		

The following references and guidelines were used for the pavement designs.

- MTO's "Adaptation and Verification of AASHTO Pavement Design Guide for Ontario Conditions," MI-183, March 2008.
- AASHTO Guide for the Design of Pavement Structures, 1993.
- "Procedures for Estimating Traffic Loads for Pavement Designs," Hajek J., 1995.

The pavements were designed using AASHTOWare DARWIN 3.1, a proprietary pavement design software. The AASHTO pavement design parameters used for conducting the pavement thickness designs are tabulated as follows:

INPUT PARAMETER	DESIGN REQUIREMENT		
Initial/Terminal Serviceability Index	p _i = 4.2	p _t = 2.2	
Design Period (years)	15		
Cumulative ESAL's	6,363,500		
Reliability and Standard Deviation	R = 85%	SD = 0.44	
Estimated Elastic Modulus for Subgrade (kPa)	30,000 to 35,000		
Layer Coefficients of Hot Mix Asphalt (HMA)	New HMA = 0.42	Existing HMA = 0.28	
Layer Coefficients of Granular Material	Gran A = 0.14 Existing Granular	Gran B Type I = 0.09 = 0.09	
Drainage Coefficient	m = 1 (new granula m = 1 (existing granula	ar base & subbase) nular material)	



5.5 Pavement Structure

Based on the estimated traffic loads acting over a 15 year design period, the recommended pavement structure for new construction is:

Hot mix asphalt	DFC	50 mm
10.00	HDBC	100 mm (two 50 mm lifts)
Granular A Base Co	urse	150 mm
Granular B Type I S	Subbase	500 mm
Total thickness		800 mm
Structural Number		129 mm
Granular Base Equiv	valency	783 mm

The pavement widening should be undertaken as outlined below:

- Saw cut existing edge of pavement and excavate shoulders to the design subgrade elevation then place and compact 500 mm of Granular B Type I subbase.
- Continuity of drainage should be maintained between existing and new pavement structures.
 In this regard the granular thickness in the widened area may have to be increased from the recommended thickness is some areas to match granular fill under the existing pavement.
- Place and compact 150 mm of Granular A base course.
- Pave with 50 mm DFC and 100 mm HDBC.

The structural capacity of the existing roadway (Dixie Road) was assessed for the design traffic. Rehabilitation design was considered for a service life extension of 15 years and a structural number of 123 mm is required to support the 15 year design traffic of 6,363,500 ESAL's. The effective structural number of the existing pavement is 92 mm indicating that pavement strengthening is required to meet the design structural number (123 mm).

Given the need to minimize the grade raise as much as possible we consider milling and paving to be a feasible and practical option. For a mill and pave operation we recommend milling 60 mm HMA and repaving with 115 mm HMA consisting of 50 mm DFC and 65 mm HDBC. Other rehabilitation options such as cold in place pulverization will require a significantly larger grade raise (compared to a mill and pave operation) and this may not be practical. If a grade raise cannot be accommodated full depth reconstruction will be required.

For full depth reconstruction the existing pavement structure must be removed and reconstructed. The recommended pavement structure is

Hot mix asphalt	DFC	50 mm
and the second section of the sectio	HDBC	100 mm (two 50 mm lifts)
Granular A Base Co	urse	150 mm
Granular B Type I S	ubbase	500 mm
Total thickness		800 mm
Structural Number		129 mm
Granular Base Equiv	alency	783 mm

The recommended surface course, i.e., DFC is based on MTO's directive PHY-C-016. Alternatively, a Superpave 12.5FC2 surface course can be used in which case Superpave 19.0 is recommended as the binder course.

SS1 Tack Coat must be applied between all new lifts of hot mix asphalt.

5.6 Culvert Bedding, Cover and Backfill

Bedding for CSP and/or minor concrete pipe culverts should be in accordance with the OPSD 802 series. Granular A material is recommended for bedding and cover to minor culverts.

5.7 Other Design Features

5.7.1 OHSA Soil Type

Excavations must be carried out in accordance with the Occupational Health and Safety Act and Regulations for Construction Projects. Shallow excavations for pavement construction will encounter fill material consisting of silty clay, sand and silt and sand and gravel. Excavations will also encounter native deposits of silty clay to clayey silt till and sands and silts. For the purposes of the OHSA these soils can be classified as follows:

- Fill material Type 3 soils above the water table and Type 4 soils below the water table.
- Silty Clay to Clayey Silt Till Type 2 soil above the water table and Type 3 soil below the water table.
- Sands and Silts Type 2 soil above the water table and Type 3 soil below the water table.

5.7.2 Frost Penetration & Frost Susceptibility

For design purposes assume a frost penetration depth of 1.2 m.

The frost susceptibilities of the various soils encountered within the project limits are outlined below.

- Silty Clay Fill Low to Moderate susceptibility to frost heave.
- Sand and Silt Fill Low susceptibility to frost heave.
- Silty Clay to Clayey Silt Till Low susceptibility to frost heave.
- Sands and Silts Moderate susceptibility to frost heave.

5.7.3 Stripping

For preliminary estimating purposes assume an average topsoil thickness of 195 mm in the widening areas. Full depth removal of the topsoil and any other deleterious material is required prior to constructing pavements in the widening areas.

5.7.4 Pavement Removals & Reuse of Existing Granular Fill

The average pavement thickness outlined in Section 4.1 of this report can be used for estimating asphalt removals on this project.

Samples of the granular fill comprising the pavement structure of the existing roadway were tested and compared with Granular A and Granular B Type II specifications. The results indicate that the granular material does not meet Granular A specifications and would therefore be unsuitable for this use. The material generally meets the Granular B Type II specifications and would be suitable for reuse as a Granular B material. Further testing will be required during detail design to confirm the suitability of this material

5.7.5 Padding

If conventional asphalt mixes (DFC and HDBC) are used, then HL3 Fine is recommended as padding. Superpave 9.5 hot mix asphalt is recommended as padding if Superpave mixes are used on this project.

5.7.6 Asphalt Cement Grade

OPSS 1101 recommends an increase in the high temperature range of Performance Graded Asphalt Cement by one grade in the upper 80 mm to 100 mm of hot mix. Based on this standard specification PG 64-28 is recommended for asphalt concrete mixes used on the surface course and upper binder course lifts. PG 58-28 asphalt cement is recommended for all other mixes. Mix design criteria should be in accordance with OPSS 1150.

5.7.7 Pavement Crossfall

The finished pavement surface should be adequately sloped (normally 2%) towards the sides to provide positive drainage. Continuity of drainage through the granular road base and subbase layers should be maintained between the pavement and shoulders. In this regard, the granular thickness of the shoulders may have to be increased from the above recommended thicknesses in some areas to match the thicker existing granular fill below the existing pavement.

5.7.8 Drainage

Where a rural cross-section is proposed, ditches are required to collect and remove excess surface water. In cut sections the ditch will be located adjacent to the roadway and the ditch invert must be at least 0.5 m below the top of the subgrade. For fill sections the ditch invert should extend at least 0.25 m below the base of the fill and should be separated at least 1.5 m horizontally from the toe of the fill. To promote drainage of the pavement structure, the base granulars must extend across the full width of the roadway and must daylight in the ditches.

Where an urban cross-section is proposed a continuous subdrain system designed to freely drain into catch basins will be required. The drainage system should conform to the appropriate OPS. Typical drainage details are illustrated in Figure 4.

5.7.9 Pavement Taper

At the limits of construction, appropriate tapering of pavement thickness to match the existing pavement structure should be implemented in accordance with OPSS or applicable Region of Peel practice.

5.7.10 Compaction of Base & Sub-Base Materials

All granular base and subbase materials should be placed in 150 mm lifts and compacted to 100% of Standard Proctor Maximum Dry Density (SPMDD) at $\pm 2\%$ of Optimum Moisture Content (OMC). Asphalt concrete should be placed and compacted in accordance with the appropriate OPSS or Region of Peel specifications.

6. DESIGN CONSIDERATIONS FOR CONSTRUCTIBILITY

6.1 Subgrade Preparation

The roadway improvements will involve widening of the existing roadway platform. All topsoil, organics, soft/loose and otherwise disturbed soils should be stripped from the subgrade areas. Immediately prior to placing the pavement granular courses, the exposed subgrade should be compacted and then proofrolled with a heavy rubber tired vehicle (such as a loaded gravel truck). The subgrade should be inspected for signs of rutting or displacement. Areas with rutting or displacement should be recompacted and retested or excavated and replaced with well-compacted and clean fill.

After the subgrade is prepared, fill may be placed as and where required. Embankment fill and fill placed in areas where unsuitable material is removed may consist of either granular fill or local inorganic soils provided that the placement moisture content is within $\pm 2\%$ of the Optimum Moisture Content (OMC). Fill should be placed and compacted in accordance with OPSS 501. The final 300 mm of the road subgrade should be compacted to 98% of Standard Proctor Maximum Dry Density (SPMDD) at $\pm 2\%$ of the OMC. Subgrade preparation and fill construction should not be done in the winter. The final subgrade surface should be sloped at least 3% to drain towards the side ditches.

At this site the clayey silt and silty clay soils are fine-grained soils that will become weakened when subjected to traffic when wet. If site work is carried out during periods of wet weather, then the subgrade will be easily disturbed. Sands and silts will also be easily disturbed when wet. Under inclement weather conditions an adequate granular working surface would be required to minimize disturbance and protect the integrity of the subgrade soils.

6.2 Earth Slopes

Topsoil should be stripped from the existing fill slopes prior to commencing widening. Fill and cut slopes should not be steeper than 2H:1V. Permanent cut and fill slopes and ditch slopes should be immediately vegetated after construction to minimize erosion.



6.3 Backfill

The fill material and the native silty clay to clayey silt till will generally be suitable for use as backfill materials. However, the clayey soils are not free draining, and will be difficult to handle and compact when wet. Soils that become wet may be difficult to compact and will require moisture conditioning prior to placement.

The sands and silts are considered to have a moderate frost susceptibility. Further assessment will be required during detail design to determine if these soils would be suitable for use as backfill.

Topsoil encountered at the site may be stockpiled and reused for landscaping purposes.

6.4 Soil Chemical Analysis

Four selected soil samples were submitted to AGAT Laboratories for chemical characterization with respect to general inorganic parameters including metals, pH, sulphate, sodium adsorption ratio (SAR) and electrical conductivity (EC). These are nominal parameters analysed when there are no indications of environmental impacts. The Certificate of Analysis for the chemical testing is included in Appendix D.

The analytical results were compared with the corresponding soil property use standards listed in Table 1 (All Other Types of Property Uses) and Table 3 (Industrial/Commercial/Community Property Use) of the Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act, March 09, 2004. It is anticipated that these results will be used to determine disposal options for excess soils generated during construction.

Comparison of the test results indicates that the metal concentrations were below the remediation concentrations stipulated in Tables 1 and 3. However, the SAR and chloride concentrations and electrical conductivity values exceed the guideline limits in the tested soil samples which likely reflect the impact of road salting operations. The SAR and chloride concentrations and electrical conductivity values are shown in the following table together with the corresponding Table 1 and Table 3 standards. It should be noted that there are no Table 3 standards for chloride.

	Sample Number and Location					
Parameter	BH 1 0.0 - 0.6 m	BH 5 0.6 - 1.2 m	BH 9 0.0 - 0.6 m	BH 12 0.6 - 1.2 m	MOE Table 1 Standard	MOE Table 3 Standard
Electrical Conductivity	2.72	0.71	1.2	1.33	0.47	1.4
SAR	44.6	11.4	15.3	3.52	1.0	12
Chloride	1710	313	567	778	58	NV

Debris or stained/odorous soils, which are encountered during excavation, should be segregated and reevaluated for disposal or re-use as fill and may require additional analysis.

6.5 Quality Control

The requirements for fill placement on this project have been stipulated relative to Standard Proctor Maximum Dry Density as determined by ASTM D698. Insitu determinations of density during fill placement, by procedure Method B of ASTM D2922 are recommended to demonstrate that the specified soil density is achieved.

7. LIMITATIONS AND RISK

7.1 Procedures

This investigation has been carried out using investigation techniques and engineering analysis methods consistent with those ordinarily exercised by Terraprobe and other engineering practitioners, working under similar conditions and subject to the time, financial and physical constraints applicable to this project. The discussions and recommendations that have been presented are based on the factual data obtained by Terraprobe.

It must be recognized that there are special risks whenever engineering or related disciplines are applied to identify subsurface conditions. Even a comprehensive sampling and testing programme implemented in accordance with the most stringent level of care may fail to detect certain conditions. Terraprobe has assumed for the purposes of providing design parameters and advice, that the conditions that exist between sampling points are similar to those found at the sample locations. The conditions that Terraprobe has interpreted as existing between sampling points can differ from those that actually exist.

It may not be possible to drill a sufficient number of boreholes or sample and report them in a way that would provide all the subsurface information that could affect construction costs, techniques, equipment and scheduling. Further investigations will be required in order to undertake a detail design.

7.2 Changes In Site And Scope

It must also be recognized that the passage of time, natural occurrences, and direct or indirect human intervention at or near the site have the potential to alter subsurface conditions. Groundwater conditions are particularly susceptible to change as a result of seasonal variation and alterations in drainage conditions. The discussion and recommendations are based on the factual data obtained from preliminary investigations made by Terraprobe and are intended for use by the owner and its retained designers in the preliminary design phase of the project and further investigations will be required for detail design. If there are changes to the project scope and development features, the interpretations made of the subsurface information, the geotechnical design parameters and comments relating to constructibility issues and quality control may not be relevant or complete for the revised project. Terraprobe should be retained to review the implications of such changes with respect to the contents of this report

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Terraprobe Inc.

J. G. Muckle, P.Eng.

Senior Geotechnical Engineer, Associate



ENCLOSURES

TERRAPROBE INC.

FIGURES







FIGURE

SITE PHOTOGRAPHS



PHOTOGRAPH No.1 Sta. 13+050, Looking North.



PHOTOGRAPH No.2 Sta. 10+925, Looking South.

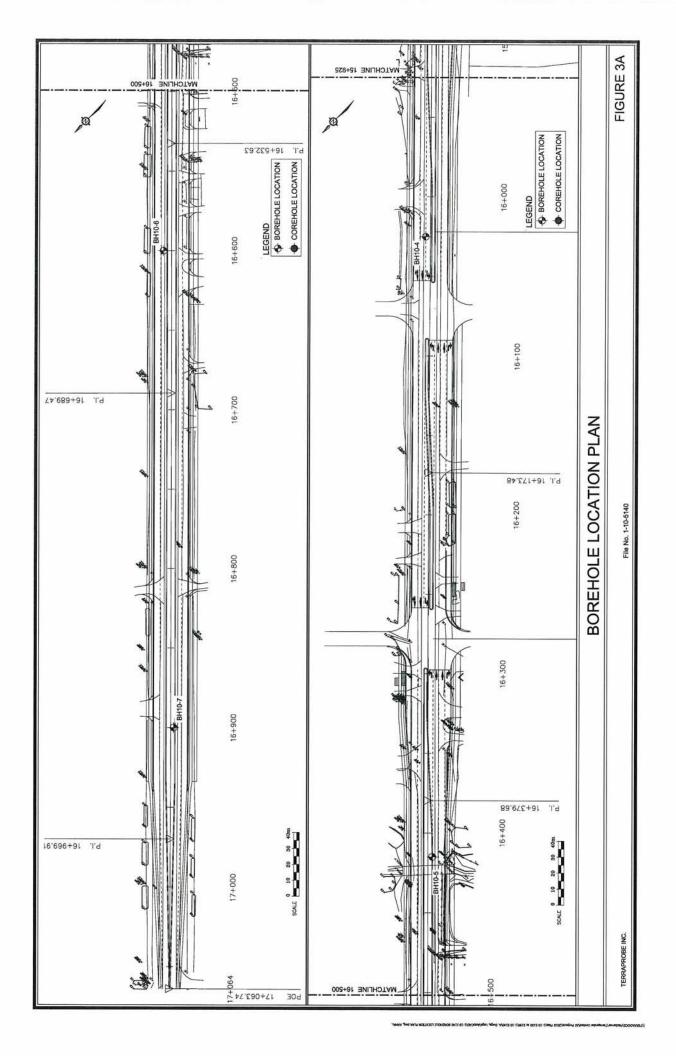
SITE PHOTOGRAPHS

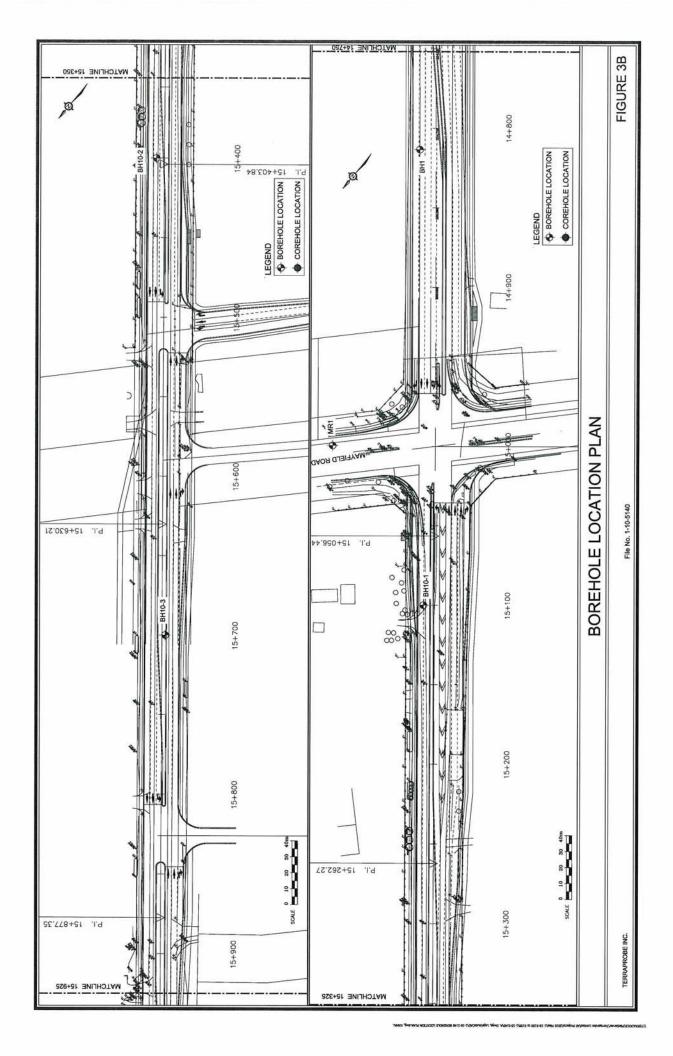


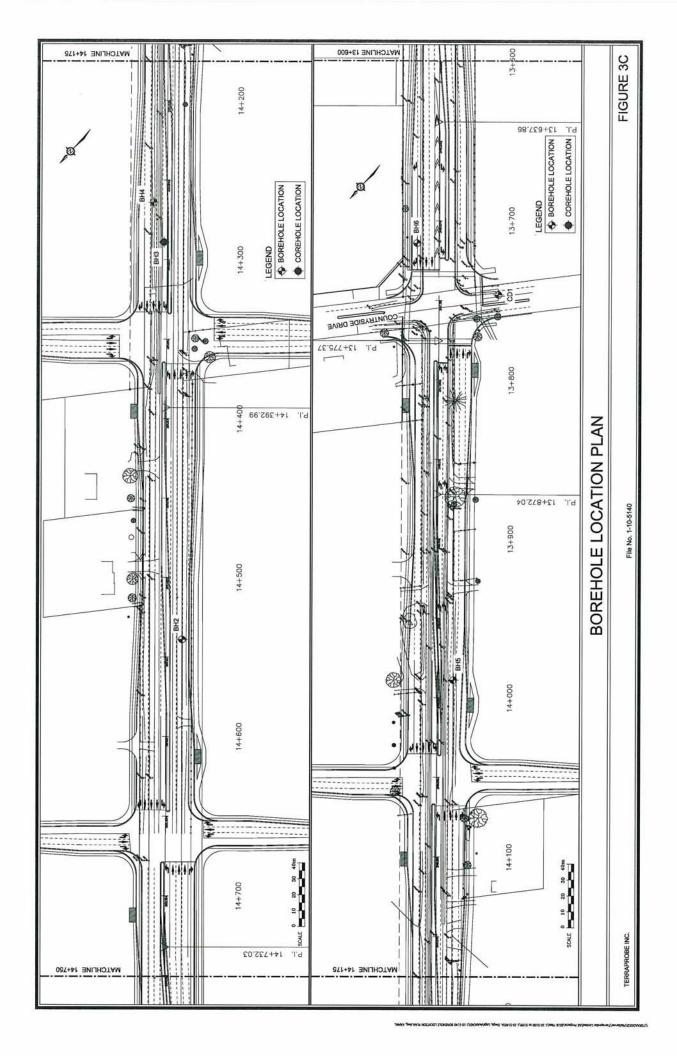
PHOTOGRAPH No.3 Sta. 9+825, Looking South.

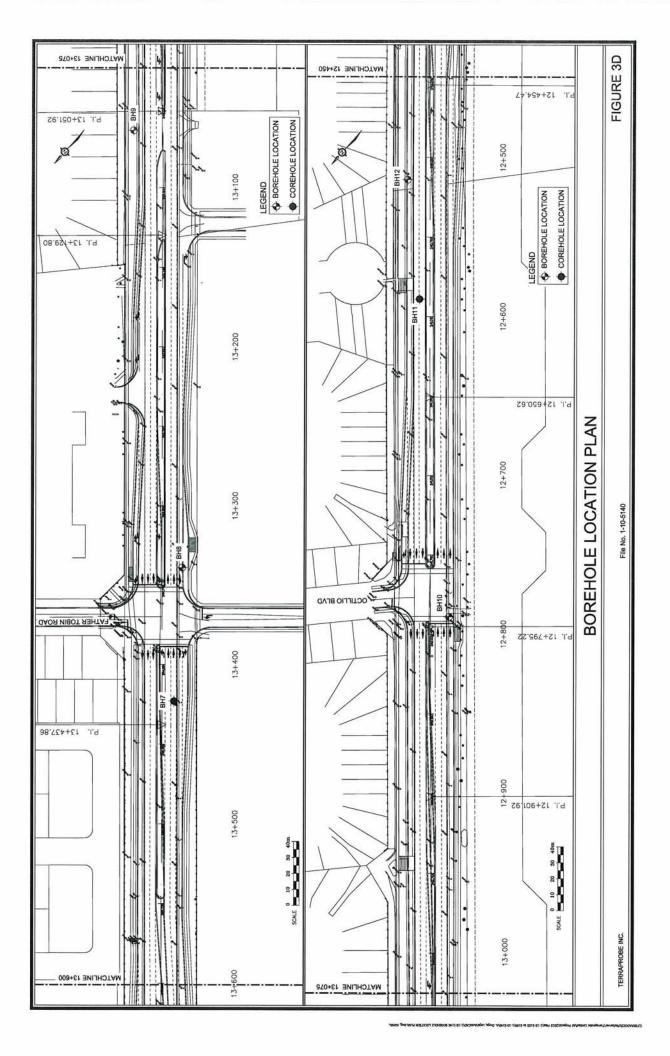


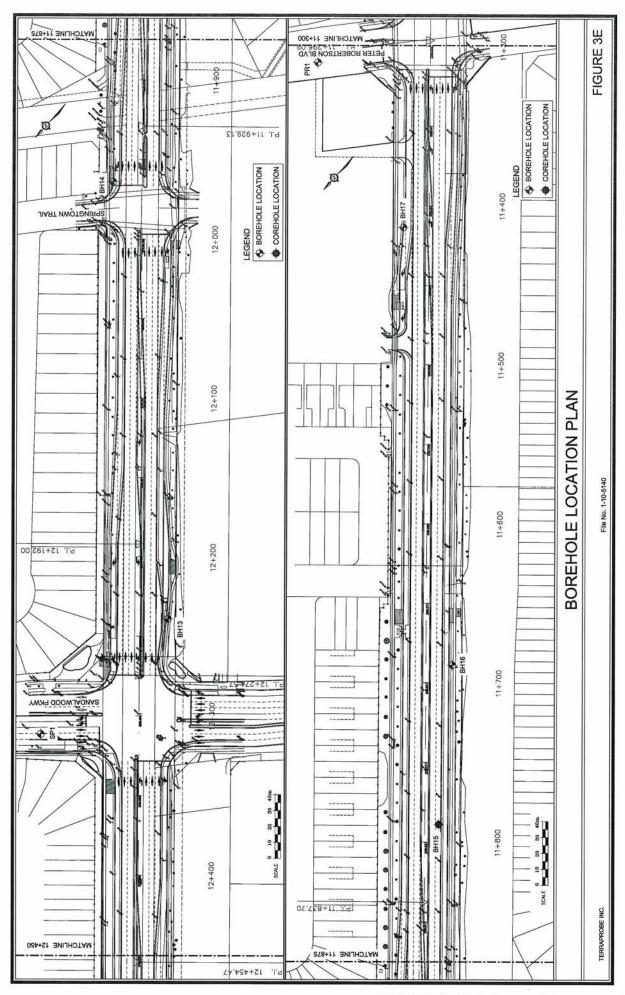
PHOTOGRAPH No.4 Sta. 8+200, Looking South.

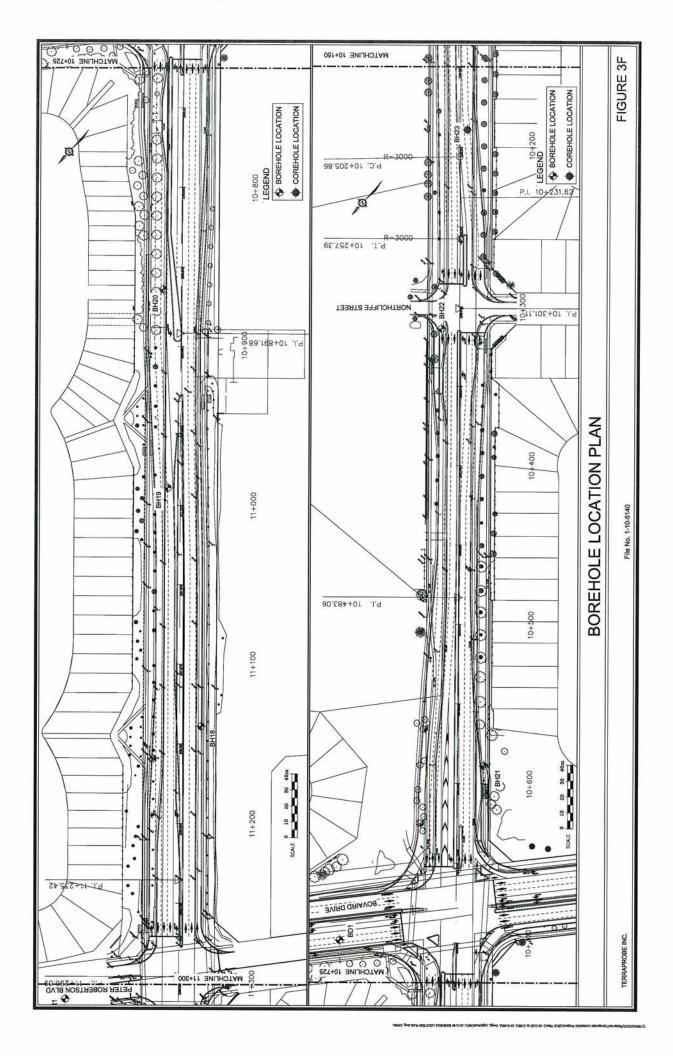


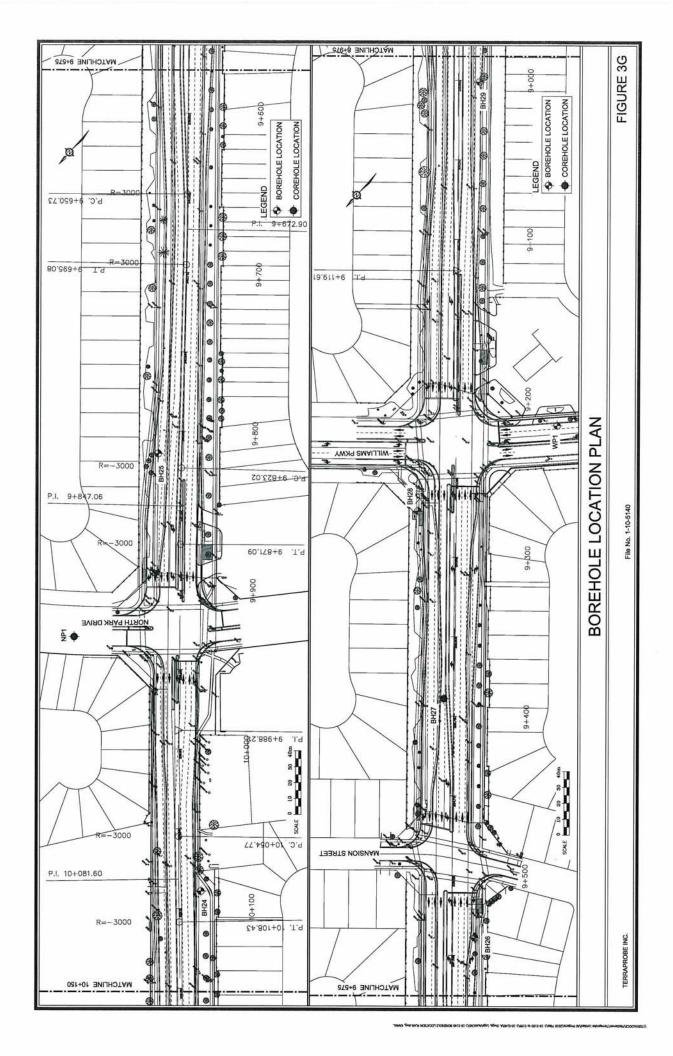


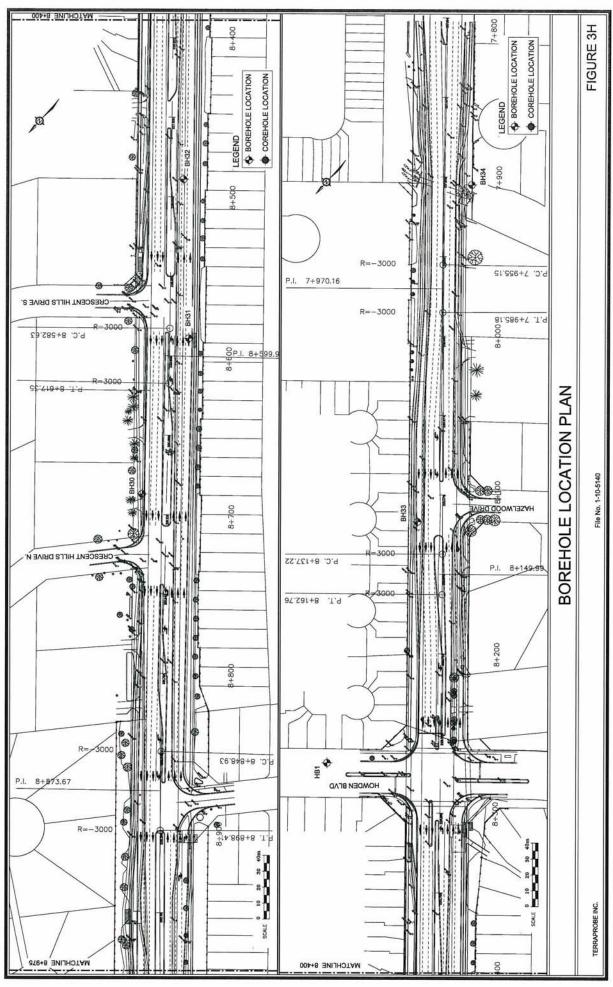












File No. 1-10-5140

TERRAPROBE

FIGURE 4

APPENDIX A



BOREHOLE LOGS

SAME	PLING METHOD	PENETRATION RESISTANCE
SS ST AS WS RC	split spoon Shelby tube auger sample wash sample rock core	Standard Penetration Test (SPT) resistance ('N' values) is defined as the number of blows by a hammer weighing 63.6 kg (140 lb.) falling freely for a distance of 0.76 m (30 in.) required to advance a standard 50 mm (2 in.) diameter split spoon sampler for a distance of 0.3 m (12 in.).
WH PH	weight of hammer pressure, hydraulic	Dynamic Cone Test (DCT) resistance is defined as the number of blows by a hammer weighing 63.6 kg (140 lb.) falling freely for a distance of 0.76 m (30 in.) required to advance a conical steel point of 50 mm (2 in.) diameter and with 60° sides on 'A' size drill rods for a distance of 0.3 m (12 in.).

SOIL DESCRIPTION - CO	HESIONLESS SOILS	SOIL DESCRI	PTION - COHESIVE	SOILS
Relative Density	'N' value	Consistency	Undrained Shear Strength, kPa	'N' value
very loose loose compact dense very dense	< 4 4 - 10 10 - 30 30 - 50 > 50	very soft soft firm stiff very stiff hard	< 12 12 - 25 25 - 50 50 - 100 100 - 200 > 200	< 2 2 - 4 4 - 8 8 - 15 15 - 30 > 30
SOIL COMPOSITION		TESTS, SYME	BOLS	
'trace' (e.g. trace silt) 'some' (e.g. some gravel) adjective (e.g. sandy) 'and' (e.g. sand and gravel	% by weight < 10 10 - 20 20 - 35 35 - 50	w, w _c water w _l liquid w _p plastic l _p plastic k coeffic Y soil ur φ' angle c' cohes		meter analysis

GENERAL INFORMATION, LIMITATIONS

The conclusions and recommendations provided in this report are based on the factual information obtained from the boreholes and/or test pits. Subsurface conditions between the test holes may vary.

The engineering interpretation and report recommendations are given only for the specific project detailed within, and only for the original client. Any third party decision, reliance, or use of this report is the sole and exclusive responsibility of such third party. The number and siting of boreholes and/or test pits may not be sufficient to determine all factors required for different purposes.

It is recommended Terraprobe be retained to review the project final design and to provide construction inspection and testing.

LOG OF BOREHOLE 1

LOCATION: Brampto	Dixie Road Improvements	COORDINATES:		DATE:	October 09, 2008
LOCATION:	Brampton, Ontario	EQUIPMENT:	Solid Stem Augers		
CLIENT:	AECOM	ELEVATION DAT	FLIM: p/a	EII E.	1 10 5140

	001 000515		_		. ==		PENETRATION		r			
	SOIL PROFILE	<u> </u>	\vdash	SAMF		SCALE	RESISTANCE PLOT		PLASTIC NA LIMIT MOI	TURAL LIQUID STURE LIMIT	ORGANIC	STANDPIPE
EPTH	DESCRIPTION Ground Surface	STRAT PLOT	NUMBER	TYPE	"N" VALUES	ELEVATION SCALE	SHEAR STRENGTO UNCONFINED POCKET PEN. 20 40 60	H kPa + FIELD VANE × LAB VANE	WP H WATER C	w w L ONTENT (%) 20 30	(bbud)	OR REMARKS
0.0	700mm FiLL - Sand and Gravel, trace silt, dense, brown, dry		1	ss	38				0			
0.7	SILTY CLAY sandy, trace gravel, very stiff, brown, damp (GLACIAL TILL)		2	ss	22				0			
			3	ss	28		GR.SA.SICL 9.29.43.19		o			

Borehole was open and dry upon completion of drilling.

LOG OF BOREHOLE 2

	Dixie Road Improvements	COORDINATES		DATE:	October 09, 2008
LOCATION:	Brampton, Ontario	EQUIPMENT:	Solid Stem Augers		
CLIENT.	AFCOM	ELEVATION DA	TUBA/-	CU C.	4 40 5440

	SOIL PROFILE		SAME	PLES	ALE	PENET RESIS	RATIO TANCE	N E PLOT	>		PLAST	IC NAT	URAL	LIQUID	5 K	STANDPIPE
ELEV DEPTH	DESCRIPTION LA SEL	NUMBER	TYPE	"N" VALUES	ELEVATION SCALE	SHEAL O UN • PO	R STI	INED	TH kP + ×	a FIELD LAB V	WA.	TER CO	w o ONTEN	WL T (%)	dd ORGANIC (a VAPOUR	INSTALLATIO OR REMARKS
0.0	610mm FILL - Sand and Gravel, trace silt, dense, brown, damp	1	ss	31			/				o					
	FILL - Silty Clay, trace sand, trace gravel, trace organics, very stiff, brown, damp	2	SS	20			<i> </i>					0				
	some sand, trace gravel, occasional sand seams, very stiff to hard, brown (GLACIAL TILL)	3	ss	37							· ·					
1.8	End of Borehole															
NOT																

Borehole was open and dry upon completion of drilling.

LOG OF BOREHOLE 3

PROJECT:	Dixie Road Improvements	COORDINATES:		DATE:	October 09, 2008
LOCATION:	Brampton, Ontario	EQUIPMENT: Solid	d Stem Augers		
CLIENT: _	AECOM	ELEVATION DATUM:	n/a	FILE: _	1-10-5140

			_														1-10-5	
	SOIL PROFILE			SAMP	LES	ALE	PENET RESIST	RATIO TANCE	PLOT	>			PLAST	IC NAT	URAL.	LIQUID LIMIT	일목	STANDPIPE
ELEV EPTH	DESCRIPTION Ground Surface	STRAT PLOT	NUMBER	TYPE	"N" VALUES	ELEVATION SCALE	SHEAI O UN • PO 20	CONFI	RENG INED	TH kP: + ×	FIELD LAB V	VANE	W _P	TER CO	w O ONTEN	w _L	d ORGANIC	INSTALLATION OR REMARKS
	155mm ASPHALT	***	Г															
0.2	FILL - Gravel and Sand, trace to some silt, compact to very dense, brown, dry to damp		1	ss	84			SA.SI		/	,		o					
			2	ss	24								o					
1.2	SILTY CLAY trace to some sand, trace gravel, occasional sand seams, very stiff, brown, damp (GLACIAL TILL)		3	ss	15									0				

Borehole was open and dry upon completion of drilling.

LOG OF BOREHOLE 4

	Dixie Road Improvements	COORDINATES:	DATE: October 09, 2008
LOCATION:	Brampton, Ontario	EQUIPMENT: Pionjar	
CLIENT:	AFCOM	ELEVATION DATUM: n/a	FILE: 1-10-5140

SOIL PROFILE				(Marie de la companion de la c		_	IPENE	TRATIC	N				_				1-10-5	
	SOIL PROFILE	_	_	SAMF	LES	ALE	RESIS	STANCE	E PLO				PLAST	IC NAT	URAL	LIQUID	NIC UR	STANDPIPE
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	ELEVATION SCALE	SHEA O UI	AR STI	RENG INED PEN.	TH ki + ×	FIELD LAB V	VANE ANE	WA:	TER CO	w OMTEN	₩ _L IT (%)	ORGANIC 3 VAPOUR	INSTALLATION OR REMARKS
0.0	Ground Surface		_			ш	2	20 4	0 0	50	80 1	00		10 2	20 :	30	2000 - 200	
255	250mm TOPSOIL																	
0.3	FILL - Silty Clay, trace sand, trace gravel, trace to some organics,		1	SS										0				
	brown, damp to moist		2	ss				3.SA.SI .17 .53.							o			
1.2	SILTY CLAY sandy, trace gravel, brown, damp (GLACIAL TILL)		3	ss										o				
1.8	End of Borehole																	
NOT																		

Borehole was open and dry upon completion of drilling.

LOG OF BOREHOLE 5

PROJECT:	Dixie Road Improvements	COORDINATES:	DATE: October 09, 2008
LOCATION:	Brampton, Ontario	EQUIPMENT: Pionjar	
CLIENT:	AECOM	ELEVATION DATUM: _ n/a	FILE:1-10-5140

ELEV DEPTH	SOIL PROFILE			SAME	LES	щ	PENE	TRATIC	NC			1.7						
			SAMPLES			PENETRATION RESISTANCE PLOT					PLAST	IC NATI	URAL	LIQUID LIMIT	N S	STANDPIPE		
10	DESCRIPTION Ground Surface	STRAT PLOT	NUMBER	TYPE	"N" VALUES	ELEVATION SCALE	SHEA O UI	AR ST NCONF	RENG INED PEN.	TH kF + ×	FIELD LAB V	VANE	WA ⁻	TER CO	W ONTEN	₩ _L	d ORGANIC	INSTALLATION OR REMARKS
	180mm TOPSOIL	===																
0.2	FILL - Silty Clay, trace sand, trace gravel, brown, damp to moist		1	ss									o					
			2	ss									c	•				
1	SILTY CLAY trace sand, trace gravel, brown / grey, damp to moist ((GLACIAL TILL)		3	SS										0				
1.8	End of Borehole																	

Borehole was open and dry upon completion of drilling.

LOG OF BOREHOLE 6

PROJECT:	Dixie Road Improvements	COORDINATES:		DATE:	October 09, 2008
LOCATION:	Brampton, Ontario	EQUIPMENT:	Pionjar		
CLIENT.	AECOM	ELEVATION DAT	TIM: n/a	EII E-	1_10_5140

SOIL PROFILE				SAMPLES			RESIS		PLOT				PLAST	IC NATU MOIS CON	JRAL TURE	LIQUID	S S	STANDPIPE
ELEV DEPTH	DESCRIPTION Ground Surface	STRAT PLOT	NUMBER	TYPE	"N" VALUES	ELEVATION SCALE	SHEA O UI	R STI		TH kP + ×	a FIELD LAB V	VANE ANE	W P WAT	TER CC	NTEN	₩L	dd ORGANIC	INSTALLATION OR REMARKS
0.0	200mm TOPSOIL																	
0.2	FILL - Silty Clay, trace sand, trace gravel, trace organics, dark brown, damp		1	SS										0				
0.6	SILTY CLAY trace sand, trace gravel, brown, damp (GLACIAL TILL)		2	ss										0				
			3	ss										o				

Borehole was open and dry upon completion of drilling.

LOG OF BOREHOLE 7

PROJECT:	Dixie Road Improvements	COORDINATES:		DATE:	October 10, 2008
LOCATION:	Brampton, Ontario	EQUIPMENT:	Bombardier/Solid Stem Augers		
CLIENT:	AECOM	ELEVATION DAT	TIM: n/a	EII E.	1-10-5140

	SOIL PROFILE			SAMP	LES	ALE	PENE	TRATIC	N E PLOT	>			PLAST	IC NATI	JRAL.	LIQUID LIMIT	의 목	STANDPIPE
ELEV DEPTH	DESCRIPTION Ground Surface	STRAT PLOT	NUMBER	TYPE	"N" VALUES	ELEVATION SCALE	SHEA O UI	R STI		TH kP	FIELD Y	VANE ANE	WA.	TER CO	ONTEN	w _L	d ORGANIC	INSTALLATION OR REMARKS
0.0	150mm ASPHALT																	
0.2	445mm FILL - Gravel and Sand, trace silt, very dense, brown, dry		1	SS	64			.SA.SI .46 . (,		6.0	0					
0.6	FILL - Silty Clay, trace sand, trace gravel, stiff, brown, damp		2	ss	12		<							О				
1.2	SILTY CLAY trace to some sand, trace gravel, hard, brown, damp (GLACIAL TILL)		3	ss	49			\	\				o	34 gg.				
1.8	End of Borehole																	

Borehole was open and dry upon completion of drilling.

LOG OF BOREHOLE 8

PROJECT:	Dixie Road Improvements	COORDINATES:	DATE: October 09, 2008
LOCATION:	Brampton, Ontario	EQUIPMENT: Pionjar	
CLIENT: _	AECOM	ELEVATION DATUM:n/a	FILE: 1-10-5140

SOIL PROFILE SAMP					LES	щ	PENE	TRATIC	ON .	_				(grades)				
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	ELEVATION SCALE	SHEA O UI	AR STI	RENG	TH kF	a FIELD	VANE	w _P		w >	LIQUID LIMIT W L	ORGANIC	STANDPIPE INSTALLATION OR REMARKS
	Ground Surface	25912	z		ż	ELE		OCKET	PEN. 0 6	× 00 8	LAB V.	ANE 00		TER CO		T (%)	(ppm)	
0.0	200mm TOPSOIL	<u> </u>																
0.2	FILL - Silty Clay, trace sand, trace gravel, brown, damp to moist		1	SS										0				
			2	ss										0				
			3	ss											o			
1.6																		
	Sampler Refusal at 1.6m																	
NOT	ES:																	

Borehole was open and dry upon completion of drilling.

LOG OF BOREHOLE 9

_	Dixie Road Improvements	COORDINATES:	DATE: October 09, 2008
LOCATION:	Brampton, Ontario	EQUIPMENT: Pionjar	
CLIENT:	AECOM	ELEVATION DATUM: P/O	FILE: 1.10.5140

	SOIL PROFILE			SAMP	LES	ALE	RESIS	TRATIC	ON E PLOT	>			PLAST	IC NATI	JRAL	LIQUID	2 €	STANDPIPE
ELEV EPTH	DESCRIPTION Ground Surface	STRAT PLOT	NUMBER	TYPE	"N" VALUES	ELEVATION SCALE	SHEA O UI	R STI	RENG INED PEN.	0 8 TH kP + ×	a FIELD LAB V	VANE ANE	22-000	TER CO	NTEN	W L T (%)	G ORGANIC S VAPOUR	INSTALLATIO OR REMARKS
0.0	180mm TOPSOIL																	
0.2	FILL - Silty Clay, trace to some sand, trace gravel, brown, dry to damp		1	SS									o					
	2000		2	SS										0				
	topsoil stained / dark grey		3	SS										0				
1.8	End of Borehole	- KXXXXX																

Borehole was open and dry upon completion of drilling.

LOG OF BOREHOLE 10

PROJECT:	Dixie Road Improvements	COORDINATES:		DATE:	October 09, 2008
LOCATION:	Brampton, Ontario	EQUIPMENT:	Pionjar		
CLIENT:	AECOM	ELEVATION DAT	'UM: _ n/a	FILE: _	1-10-5140

	SOIL PROFILE			SAMP	LES	I.E	PENE	TRATIC	N E PLOT	<u></u>			DI ACT	IC NATI	URAL	LIOLED	Ω α	STANDPIPE
ELEV DEPTH	DESCRIPTION Ground Surface	STRAT PLOT	NUMBER	TYPE	"N" VALUES	ELEVATION SCALE	SHEA O UI	AR ST NCONF	RENG	TH kF	Pa FIELD LAB V	VANE	WA.	TER CO	w OMTEN	WL T (%)	d ORGANIC	INSTALLATION OR REMARKS
0.0																		
0.2	FILL - Silty Clay, trace sand, trace gravel, trace organics,	222	1	ss									o					
	occasional asphalt inclusions, brown, damp		2	ss									c					
1.2	SILTY CLAY - Weathered, trace sand, trace gravel, brown, damp (GLACIAL TILL)		3	ss										o				
1.8	End of Borehole	EEEE	H		-													

Borehole was open and dry upon completion of drilling.

LOG OF BOREHOLE 11

PROJECT:	Dixie Road Improvements	COORDINATES:	COORDINATES:		October 10, 2008
LOCATION:	Brampton, Ontario	EQUIPMENT:			
CLIENT:	AECOM	ELEVATION DAT	FILE:	1-10-5140	

SOIL PROFILE SAN				SAMP	LES	щ	PENE	TRATIC	N N	_							
ELEV DEPTH		STRAT PLOT	NUMBER	TYPE	"N" VALUES	ELEVATION SCALE	SHEA O U	AR STI		0 8 TH kP + ×	a FIELD LAB V	W _P	TER CO	W OMTEN	WL T (%)	G ORGANIC 3 VAPOUR	STANDPIPE INSTALLATION OR REMARKS
0.0	145mm ASPHALT	51															
0.1			1	SS	44			/	/			o					
0.6	SILTY CLAY sandy, trace gravel, occasional sand seams, stiff to hard, brown, damp (GLACIAL TILL)		2	SS	12												
			3	ss	34												
1.8	End of Borehole																

NOTES

Borehole was open and dry upon completion of drilling.

LOG OF BOREHOLE 12

PROJECT: _	Dixie Road Improvements	COORDINATES:		DATE:	October 09, 2008
LOCATION:	Brampton, Ontario	EQUIPMENT:	Pionjar		
CLIENT:	AECOM	ELEVATION DAT	UM: _n/a	FILE: _	1-10-5140

	SOIL PROFILE			SAMP		_	PENE	TRATIC	N		_						1-10-0	
<u>ELEV</u> DEPTH	DESCRIPTION Ground Surface	STRAT PLOT	NUMBER	TYPE	"N" VALUES	ELEVATION SCALE	SHEA O UI	R STI	RENG'	0 8 TH kP + ×	a FIELD LAB V	VANE		TER CO	w O ONTEN	LIQUID LIMIT WL T (%)	dd ORGANIC	STANDPIPE INSTALLATION OR REMARKS
0.0	180mm TOPSOIL		1	ss										o				
			2	ss									c	•				
4.0	Ford of Doorholds		3	ss										0				
1.8	End of Borehole		*															

Borehole was open and dry upon completion of drilling.

LOG OF BOREHOLE 13

PROJECT: _	Dixie Road Improvements	COORDINATES:		DATE:	October 09, 2008
LOCATION:	Brampton, Ontario	EQUIPMENT:	Pionjar		
CLIENT:	AECOM	ELEVATION DAT	UM: _n/a	FILE: _	1-10-5140

SOL PROFILE SAMPLES SAMPLES PERETRATION PENETRATION	0140	1-10-5				_			-11/4			VAIIC						SOIL PROFILE					
0.0 130mm TOPSOIL 0.1 FILL - Silty Clay, trace to some sand, trace gravel, brown, damp to moist 1 SS 2 SS	STANDPIPE	일목	LIQUID	URAL	IC NAT	PLAST			>	DN E PLOT	STANC	RESIS	ALE	LES	SAME	_		SOIL PROFILE					
0.1 Isomm TOPSOIL O.1 FILL - Silty Clay, trace to some sand, trace gravel, brown, damp to moist 1 SS 2 SS 3 SS	INSTALLATION OR REMARKS		₩ _L T(%)	w OMTEN	TER CO	₩ _P	VANE ANE	a FIELD LAB V	TH kF + ×	RENG INED PEN.	AR ST NCONF OCKET	SHE/ O U • P	ELEVATION SC	"N" VALUES	TYPE		25/60	Ground Surface					
FILL - Silty Clay, trace to some sand, trace gravel, brown, damp to moist 1 SS 2 SS 3 SS					35												EEE	130mm TOPSOIL	0.0				
3 SS						0									ss			FILL - Silty Clay, trace to some sand, trace gravel,	0.1				
						c									ss	2							
															ss	3							
																	~~~	End of Borehole	1.8				
NOTES:																							

Borehole was open and dry upon completion of drilling.

### **LOG OF BOREHOLE 14**

PROJECT: _	Dixie Road Improvements	COORDINATES:		DATE:	October 10, 2008
LOCATION:	Brampton, Ontario	EQUIPMENT:	Pionjar		
CLIENT:	AECOM	ELEVATION DAT	UM: _n/a	FILE: _	1-10-5140

					LLL				100	4					·	1-10-5	140
SOIL PROFILE			SAME	LES	ALE	PENE	TRATIC	N E PLOT	$\geq$			PLAST	IC NATI	JRAL	LIQUID LIMIT	#IC JR	STANDPIPE
ELEV DESCRIPTION  Ground Surface	STRAT PLOT	NUMBER	TYPE	"N" VALUES	ELEVATION SCALE	SHEA O UI	AR STI	RENG	TH kP + ×	FIELD LAB V	VANE	W _P WA	IER CC	V ONTEN	₩ <u>L</u>	ORGANIC S VAPOUR	INSTALLATION OR REMARKS
0.0 180mm TOPSOIL	E 2																
0.2 FILL - Silty Clay, trace sand, trace gravel, brown, damp	===	1	SS										Ö				
o.6  FILL - Sand and Silt, trace sand, trace to some gravel, brown, damp to moist		2	SS				38.36.					o					
1.2 End of Borehole	- KXXXX	$\Box$															
* Borehole terminated at 1.2m due obstruction	e to																
NOTES:		_	-		7										-		

Borehole was open and dry upon completion of drilling.

### **LOG OF BOREHOLE 15**

PROJECT:	Dixie Road Improvements	COORDINATES:		DATE:	October 10, 2008
LOCATION:	Brampton, Ontario	EQUIPMENT:	Bombardier/Solid Stem Augers		
CLIENT:	AECOM	ELEVATION DA	ГUM: _n/a	FILE:	1-10-5140

			_							_11/6			_				1-10-0	
	SOIL PROFILE			SAMP	LES	ALE	RESIS	TRATIC	ON E PLOT	>			PLAST	IC NATI	URAL	LIQUID LIMIT	를 또	STANDPIPE
ELEV DEPTH	DESCRIPTION  Ground Surface	STRAT PLOT	NUMBER	TYPE	"N" VALUES	ELEVATION SCALE	SHE/ O U • P	AR ST NCONF OCKET		TH kP + ×	FIELD LAB V	VANE	MA.	TER CO	w OMTEN	w _L	GO ORGANIC (S) VAPOUR	INSTALLATION OR REMARKS
0.0	165mm ASPHALT														\$4. F			
0.2	445mm FILL - Sandy Gravel, trace silt, very dense, brown, dry		1	SS	83			32 . 5		/			o					
0.6	FILL - Silty Clay, and sand, trace gravel, stiff, brown, damp		2	SS	17		GF 5	8A.SI 36 .40.						o				
1.2	SILTY CLAY trace sand, trace gravel, very stiff, brown, damp (GLACIAL TILL)		3	SS	25									o				
1.8																		

Borehole was open and dry upon completion of drilling.

### **LOG OF BOREHOLE 16**

PROJECT: _	Dixie Road Improvements	COORDINATES:		DATE:	October 09, 2008
LOCATION:	Brampton, Ontario	EQUIPMENT:	Pionjar		
CLIENT:	AECOM	ELEVATION DAT	'UM: _n/a	FILE: _	1-10-5140

	SOIL PROFILE		SAME	PLES	ALE	PENE RESIS	TRATIC	ON E PLOT	>	((		PI AST	IC NAT	URAL	HOUR	۵ ×	STANDPIPE
ELEV DEPTH	DESCRIPTION  Ground Surface	NUMBER	TYPE	"N" VALUES	ELEVATION SCALE	SHEA O UN	R ST NCONF		TH kF	a FIELD LAB V	VANE	MA.	TER CO	w O ONTEN	WL WL T (%)	GORGANIC (S) VAPOUR	INSTALLATION OR REMARKS
0.0	150mm TOPSOIL	12												J. 156			
0.2		1	ss									c					
		2	ss									,	•				
		3	ss									,	,				

NOTES:

Borehole was open and dry upon completion of drilling.

### **LOG OF BOREHOLE 17**

PROJECT:	Dixie Road Improvements	COORDINATES:	DATE: October 09, 2008
LOCATION:	Brampton, Ontario	EQUIPMENT: Pionjar	
CLIENT:	AECOM	ELEVATION DATUM: n/a	FILE: 1-10-5140

	SOIL PROFILE	_		SAMP	IES	l m	PENE	TRATIC	N	- 110	-	-			-		1	
	OOK I NOT ILL	LOT				N SCALI	RESIS	STANCI	E PLOT	80 8	30 1	90	PLAST LIMIT W P	IC NATI	URAL STURE ITENT W	LIQUID LIMIT W L	ORGANIC	STANDPIPE INSTALLATION OR
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	ELEVATION SCALE	0 U	NCONF OCKET	PEN.	+ ×	FIELD LAB V	ANE	WA'	TER CO	O ONTEN	T (%)	(ppm)	REMARKS
0.0	Ground Surface 230mm TOPSOIL	EEE						10 4	10 6	50 8	30 1	00		0 2	20 3	30		
0.2	FILL - Silty Clay, trace sand, trace gravel, trace rootlets, brown, damp		1	SS									7.5	О				
	brown, damp		2	ss										o				
1.2	SILTY CLAY trace sand to sandy, trace gravel, brown, damp (GLACIAL TILL)		3	ss										0				
1.8	End of Borehole																	
NOT																		

NOTES:

Borehole was open and dry upon completion of drilling.

### **LOG OF BOREHOLE 18**

PROJECT:	Dixie Road Improvements	COORDINATES:		DATE:	October 09, 2008
LOCATION:	Brampton, Ontario	EQUIPMENT:	Pionjar		
CLIENT:	AECOM	ELEVATION DAT	'UM: _ n/a	FILE:	1-10-5140

	SOIL PROFILE			SAMP	LES	J.	PENE	TRATIO	N E PLOT	_			DIACT	IC NATI	URAL	LIOUID	o ~	STANDPIPE
ELEV DEPTH	DESCRIPTION  Ground Surface	STRAT PLOT	NUMBER	TYPE	"N" VALUES	ELEVATION SCALE	SHE	AR ST NCONF	RENG	TH kF + ×	Pa FIELD LAB V	VANE	W P	TER CO	w O ONTEN	WL T (%)	dd ORGANIC	INSTALLATION OR REMARKS
0.0	250mm TOPSOIL																	
0.3	FILL - Silty Clay, trace sand, trace gravel, trace organics,		1	ss									c					
	brown, damp to moist		2	ss										o				
			3	ss						•				0				
			4	ss										o				
2.4	FILL - Sand and Gravel, trace clay, trace silt, brown, dry to damp		5	SS									o					
3.0	End of Borehole																	
NOT	FS:	Ш																

Borehole was open and dry upon completion of drilling.

### **LOG OF BOREHOLE 19**

PROJECT:	Dixie Road Improvements	COORDINATES:		DATE:	October 10, 2008
LOCATION:	Brampton, Ontario	EQUIPMENT:	Bombardier/Solid Stem Augers		
CLIENT:	AECOM	ELEVATION DAT	'UM: _ n/a	FILE:	1-10-5140

SOIL PROFILE  SAMPLES  DESCRIPTION  DESCRIPT	ELEV DESCRIPTION  DESCRIPTION  Ground Surface  1 SS 55  Very dense, brown, dry  DESCRIPTION  SILTY CLAY some sand to sandy, trace gravel, stiff, brown, damp to moist  12 SILT AND SAND trace clay, trace gravel, occasional cobbles, dense, brown, moist to wet  SILT AND SAND trace gravel, occasional cobbles, dense, brown, moist to wet  SILTY CLAY some sand to wet  SILTY CLAY some sand to sandy, trace gravel, occasional cobbles, dense, brown, moist to wet  SILTY CLAY some sand to sandy, trace gravel, occasional cobbles, dense, brown, moist to wet		CLIENT: AECOM			_	ELE	VATIC	IN DA	I UIVI:	- n/a	<u> </u>			_	_ r	ILE: _	1-10-5	140
0.0 150mm ASPHALT  0.2 450mm FILL - Gravel and Sand, trace silt, very dense, brown, dry  0.6 SILTY CLAY some sand to sandy, trace gravel, stiff, brown, damp to moist  1.2 SILT AND SAND trace clay, trace gravel, occasional cobbles, dense, brown, moist to wet	Got States of Storm ASPHALT  2.4 450mm FBLL - Gravel and Sand, trace states of the state of the		SOIL PROFILE	$\Box$	SAM	1PLES	ALE	PENE	TRATIO	N PLOT	$\geq$			PI AST	IC NATI	URAL	LIQUID	5 K	STANDPIPE
1.2 SILT AND SAND trace clay, trace gravel, occasional cobbles, dense, brown, moist to wet	1.2 SLT AND SAND trace gravel, exceeding to gravely	ELEV DEPTH		STRAT PLOT	TYPE	"N" VALUES	ELEVATION SC	SHEA O UI	R STE	0 60 RENGT INED PEN.	0 8 TH kP: + ×	0 10 a FIELD 1 LAB VA	VANE ANE	W _P	TER CO	w OMTEN	w _L → T (%)		OR
450mm Fill - Gravel and Sand, trace silt, very dense, brown, dry  0.6 SILTY CLAY some sand to sandy, trace gravel, stiff, brown, damp to moist  2 SS 11  1.2 SILT AND SAND trace clay, trace gravel, occasional cobbles, dense, brown, moist to wet  3 SS 47 GR.SA.SI.Q. 5 42.45.8	450mm FILL - Gravel and Sand, trace gitt, very dense, brown, dry  0.4  SLTY CLAY some sand to sandy, trace gravel, aliff, brown, damp to moist  1.2  SLT AND SAND trace day, trace gravel, occasional cobbles, dense, brown, moist to wet  1.8  End of Borehole	0.0																	
SILTY CLAY some sand to sandy, trace gravel, stiff, brown, damp to moist  2 SS 11  SILT AND SAND trace clay, trace gravel, occasional cobbles, dense, brown, moist to wet  3 SS 47  GR.SA.SILL  5 42.45.8	SILTY CLAY some sand to sandy, frace gravel, stiff, brown, damp to moist  1.2  SILT AND SAND trace day, trace gravel, cocasional cobbles, dense, brown, moist to wet  1.8  End of Borehole  1.9  End of Borehole		450mm FILL - Gravel and Sand, trace silt, very dense, brown, dry	1	ı ss	55				/				o					
SILT AND SAND trace clay, trace gravel, occasional cobbles, dense, brown, moist to wet	SILT AND SAND trace clay, trace gravel, occasional cobbles, dense, brown, moist to wet  1.8 End of Borehole  SILT AND SAND GR SASIQUE 5 42,45,8  O  O  O  O  O  O  O  O  O  O  O  O  O	0.6	SILTY CLAY some sand to sandy, trace gravel,	2	2 SS	11		<							0				
	1.8 End of Borehole	1.2	SILT AND SAND trace clay, trace gravel, occasional cobbles, dense, brown, moist to wet		3 SS	47		GF 5	S.SA.SI. 42 .45.	8 4					0				
		1.8	End of Borehole																

Borehole was open and dry upon completion of drilling.

### **LOG OF BOREHOLE 20**

PROJECT:	Dixie Road Improvements	COORDINATES:		DATE:	October 09, 2008
LOCATION:	Brampton, Ontario	EQUIPMENT:	Pionjar		
CLIENT:	AECOM	ELEVATION DAT	'UM: _n/a	FILE: _	1-10-5140

-	CLIENT: AECOM		_			_		TRATIC		_11/6	a					ILE	1-10-5	140
	SOIL PROFILE	1	_	SAMP	LES	SALE	RESIS	STANC	E PLOT				PLAST	IC NAT	URAL STURE STENT	LIQUID	NIC UR	STANDPIPE
ELEV DEPTH	DESCRIPTION  Ground Surface	STRAT PLOT	NUMBER	TYPE	"N" VALUES	ELEVATION SCALE	SHE/ O U	AR ST NCONF	RENG	TH kP + ×	FIELD LAB V	VANE	W _P	TER CO	w O ONTEN	—₁ 	dd ORGANIC	INSTALLATION OR REMARKS
0.0	250mm TOPSOIL																	
0.3	FILL - Sand, trace to some gravel, occasional silty clay inclusions, brown, damp		1	ss									0					
0.6	FILL - Silty Clay, trace sand, trace gravel, brown, damp		2	SS										o				
1.2	SILTY CLAY trace to some sand, trace gravel, grey, damp (GLACIAL TILL)		3	ss										•				
1.8	End of Borehole																	

NOTES

Borehole was open and dry upon completion of drilling.

### **LOG OF BOREHOLE 22**

PROJECT:	Dixie Road Improvements	COORDINATES:	}	DATE:	October 10, 2008
LOCATION:	Brampton, Ontario	EQUIPMENT:	Pionjar		
CLIENT:	AECOM	ELEVATION DAT	ГUM: _ n/a	FILE: _	1-10-5140

	SOIL PROFILE			SAMF	LES	ALE	PENE	TRATIO	ON E PLOT	>			PLAST	IC NAT	URAL	LIQUID	일말	STANDPIPE
ELEV DEPTH	DESCRIPTION  Ground Surface	STRAT PLOT	NUMBER	TYPE	"N" VALUES	ELEVATION SCALE	SHEA O U	AR ST NCONF	RENG	0 TH kf + ×	a FIELD LAB V	VANE	MA.	TER CO	w O ONTEN	LIQUID LIMIT W L T (%)	dd ORGANIC (3 VAPOUR	INSTALLATION OR REMARKS
0.0	150mm TOPSOIL	EEE																
0.2	FILL - Silty Clay, trace sand, trace gravel, trace organics, brown / dark brown, damp		1	ss										o				
			2	ss										c	X.			
1.2	SILTY CLAY trace sand, trace gravel, brown, damp (GLACIAL TILL)		3	SS										o				

NOTES:

Borehole was open and dry upon completion of drilling.

### **LOG OF BOREHOLE 23**

PROJECT:	Dixie Road Improvements	COORDINATES:		DATE:	October 10, 2008
LOCATION:	Brampton, Ontario	EQUIPMENT:	Solid Stem Augers		
CLIENT:	AECOM	ELEVATION DAT	**************************************	_ FILE: _	1-10-5140

0.0 150 0.2 450 trace very 0.6 SILT trace very	CLIENT: AECOM		_		_	ELE	VATIC	N DA	I UNI:	n/a	3			_	_ F	ILE: _	1-10-5	140
0.0 150 0.2 450 trace very 0.6 SILT trace very (GL	SOIL PROFILE			SAMP	LES	ALE	PENE	TRATIC	N E PLOT	>			PLAST	IC NATI	JRAL.	LIQUID	S 8	STANDPIPE
0.0 150 0.2 450 trace very 0.6 SILT trace very (GL	DESCRIPTION round Surface	STRAT PLOT	NUMBER	TYPE	"N" VALUES	ELEVATION SCALE	SHEA O U	AR STI		TH kP + ×	FIELD LAB V	VANE	W P WAT	TER CC	NTEN	LIQUID LIMIT W L T (%)	dd ORGANIC (a VAPOUR	INSTALLATION OR REMARKS
0.2 450 trace very 0.6 SILT trace very (GL	50mm ASPHALT		_											20 /0			-	
SIL ¹ trace very (GL	50mm FILL - Sandy Gravel, ace silt, ery dense, brown, dry		1	SS	54			.SA.SI .28 .	&CL				o					
1.8	ILTY CLAY ace sand, trace gravel, ery stiff to hard, brown, damp GLACIAL TILL)		2	SS	17		,							0				
1.8			3	SS	70				\	\				0				
NOTES:	End of Borehole																	

Borehole was open and dry upon completion of drilling.

### **LOG OF BOREHOLE 24**

PROJECT: _	Dixie Road Improvements	COORDINATES:		DATE:	October 10, 2008
LOCATION:	Brampton, Ontario	EQUIPMENT:	Pionjar	7:	
CLIENT:	AECOM	ELEVATION DAT	UM: _n/a	FILE: _	1-10-5140

	SOIL PROFILE		Г	SAMP	LES	ш	PENE	TRATIC	ON OT	TV							1-10-5	
ELEV EPTH	DESCRIPTION  Ground Surface	STRAT PLOT	NUMBER	TYPE	"N" VALUES	ELEVATION SCALE	SHEA O UI	R STI		0 8 TH kP + ×	a FIELD LAB V	VANE	W P WAT	TER CO	NTEN	LIQUID LIMIT W.L T (%)	G ORGANIC S VAPOUR	STANDPIPE INSTALLATION OR REMARKS
0.0	180mm TOPSOIL	=== ====								22								
0.2		355	1	SS										o				
0.6	SILTY CLAY trace sand, trace gravel, brown, damp (GLACIAL TILL)		2	ss										o				
			3	ss										o				

Borehole was open and dry upon completion of drilling.

### **LOG OF BOREHOLE 25**

PROJECT:	Dixie Road Improvements	COORDINATES:	DATE:	October 10, 2008
LOCATION:	Brampton, Ontario	EQUIPMENT: Pionjar		
CLIENT:	AECOM	ELEVATION DATUM:n/a	FILE: _	1-10-5140

	SOIL PROFILE	LES	I.E	PENETRATION RESISTANCE PLOT						, NAT	URAI		Ω œ	STANDPIPE				
ELEV DEPTH	DESCRIPTION  Ground Surface	STRAT PLOT	NUMBER	TYPE	"N" VALUES	ELEVATION SCALE	SHEA O U	AR ST NCONF	RENG	TH kF + ×	Pa FIELD LAB V	VANE	W _P	TER CO	w O ONTEN	WL T (%)	dd ORGANIC (a VAPOUR	INSTALLATION OR REMARKS
0.0	200mm TOPSOIL	EEE																
0.2	FILL - Silty Clay, trace sand, trace gravel, trace organics, brown / dark brown, damp to moist		1	ss										c				
1.2	race sand, trace gravel,	2 S	SS										c					
1,2	SILTY CLAY - Weathered, trace sand, trace gravel, brown, damp (GLACIAL TILL)		3	ss										o				
1.8	End of Borehole																	

Borehole was open and dry upon completion of drilling.

### **LOG OF BOREHOLE 26**

PROJECT: _	Dixie Road Improvements	COORDINATES:		DATE:	October 10, 2008
LOCATION:	Brampton, Ontario	EQUIPMENT:	Pionjar		
CLIENT:	AECOM	ELEVATION DAT	UM:n/a	FILE: _	1-10-5140

RESISTANCE PLOT PLASTIC NATURAL LIQUID LIMIT CONTRIBUTION OF STANDPIPE INSTALLATION OR WELL AND STANDPIPE CONTRIBUTION OR		COULDED TO			011	V EC	_	PENE	TRATIC	ON				_		= '		1-10-5	
0.0 150mm TOPSOIL  0.2 FILL - Silty Clay, trace sand, trace gravel, brown, damp  0.6 End of Borehole  * Borehole terminated at 0.6m due to							SALE	RESISTANCE PLOT					PLAST	PLASTIC NATURAL LIQUID			NIC UR	STANDPIPE	
0.0 150mm TOPSOIL  0.2 FILL - Silty Clay, trace sand, trace gravel, brown, damp  0.6 End of Borehole  * Borehole terminated at 0.6m due to	ELEV DEPTH		41		TYPE	"N" VALUES	ELEVATION SC	O U	AR STI	RENG INED PEN.	TH kF + ×	Pa FIELD LAB V	VANE ANE	MA.	TER CO	w o ONTEN	₩ _L IT (%)		
0.2 FILL - Silty Clay, trace sand, trace gravel, brown, damp  0.6 End of Borehole * Borehole terminated at 0.6m due to	0.0		222							10 570					200				
* Borehole terminated at 0.6m due to		FILL - Silty Clay, trace sand, trace gravel, brown, damp		1	ss										٥				
	0.6	End of Borehole  * Borehole terminated at 0.6m due to																	

Borehole was open and dry upon completion of drilling.

### **LOG OF BOREHOLE 27**

PROJECT:	Dixie Road Improvements	COORDINATES:		DATE:	October 10, 2008
LOCATION:	Brampton, Ontario	EQUIPMENT:	Bombardier/Solid Stem Augers		
CLIENT:	AECOM	ELEVATION DAT	'UM: _n/a	FILE:	1-10-5140

	CLIENT: AECOM	_		_	CLE	VATION DA	I UIVI.					— F	LE	1-10-5	140
	SOIL PROFILE	LES	S PENETRATION RESISTANCE PLOT						PLASTIC NATURAL LIQUIC MOISTURE LIMIT CONTENT LIMIT				STANDPIPE		
ELEV DEPTH	DESCRIPTION LOCAL DESCRIPTION	NUMBER	TYPE	"N" VALUES	ELEVATION SCALE	20 4 SHEAR STI O UNCONF POCKET 20 4	RENGT	H kPa + FIE × LAE	100 LD VANE 3 VANE 100	W _P		W ONTENT	₩ _L —1 Γ(%)	d ORGANIC	INSTALLATION OR REMARKS
0.0	145mm ASPHALT	9													
0.1		1	ss	36		GR.SA.SI 42.49	&CL			0					
0.7	52220	2	SS	21							0				
		3	ss	46			\			o					
1.8	End of Borehole														
NOT	ES:										55				

Borehole was open and dry upon completion of drilling.



### **LOG OF BOREHOLE 28**

PROJECT:	Dixie Road Improvements	COORDINATES:		DATE:	October 10, 2008
LOCATION:	Brampton, Ontario	EQUIPMENT:	Pionjar		
CLIENT:	AECOM	ELEVATION DAT	TUM: n/a	FILE:	1-10-5140

	SOIL PROFILE			SAMF	LES	ALE	PENE RESIS	TRATIC	ON E PLOT	>	S.		PLAST	IC NAT	URAL	LIOUID	o	STANDPIPE
ELEV DEPTH	DESCRIPTION  Ground Surface	STRAT PLOT	NUMBER	TYPE	"N" VALUES	ELEVATION SCALE	SHEA O UI	AR STI	RENG INED PEN.	TH kF + ×	FIELD LAB V	VANE	W _P WAT	TER CO	W OONTEN	WL T (%)	d ORGANIC	INSTALLATION OR REMARKS
0.0	200mm TOPSOIL																	
0.2	trace sand, trace gravel, brown / dark brown, damp to moist		1	SS										0				
	trace organics, topsoil stained below 0.6m		2	ss											o			
			3	SS											c			
1.8	End of Borehole																	

NOTES

Borehole was open and dry upon completion of drilling.

### **LOG OF BOREHOLE 29**

PROJECT:	Dixie Road Improvements	COORDINATES:		DATE:	October 10, 2008
LOCATION:	Brampton, Ontario	EQUIPMENT:	Pionjar		
CLIENT:	AECOM	<b>ELEVATION DAT</b>	UM: _n/a	FILE:	1-10-5140

	CEIENT: AECON							N DA		11/6	a :						1-10-5	140
	SOIL PROFILE			SAMP	LES	ALE	PENE	TRATIC	ON E PLOT	>			PLAST	IC NATI	URAL	LIQUID LIMIT	5 K	STANDPIPE
ELEV DEPTH	DESCRIPTION  Ground Surface	STRAT PLOT	NUMBER	TYPE	"N" VALUES	ELEVATION SCALE	O UI	AR ST NCONF		TH kF + ×	FIELD LAB V	VANE	WA.	TER CO	W ONTEN	w _L	d ORGANIC	INSTALLATION OR REMARKS
0.0	180mm TOPSOIL	===															-	-
0.2			1	SS									c					
0.6	SANDY SILT trace clay, brown, wet		2	SS										o				
			3	SS				S.SA.SI 25 .65.						c				
1.8	End of Borehole																	
	TES:																	

Borehole was open and dry upon completion of drilling.

### **LOG OF BOREHOLE 30**

PROJECT:	Dixie Road Improvements	COORDINATES:		DATE:	October 10, 2008
LOCATION:	Brampton, Ontario	EQUIPMENT:	Pionjar		
CLIENT:	AECOM	<b>ELEVATION DAT</b>	'UM: _ n/a	FILE:	1-10-5140

SOIL PROPILE	CLIENT: AECOM			FLE			TUM:	n/a	a				_ F	ILE: _	1-10-5	140		
150mm TOPSOIL   1   1   1   1   1   1   1   1   1	SOIL PROFILE			SAMF	LES	ALE	PENE	TRATIC	N E PLOT	>			PLAST	IC NATI	URAL	LIQUID	일본	
0.0 150mm TOPSOIL  0.2 SILTY CLAY sandy, trace gravel, brown, damp  (GLACIAL TILL)  2 SS GF.SA.SICL 6 23.46.25		STRAT PLOT	NUMBER	TYPE	"N" VALUES	ELEVATION SC	O U	AR STI	RENG INED PEN.	TH kF + ×	Pa FIELD LAB V	VANE ANE	WA.	TER CO	w ONTEN	w _L T (%)		OR
SILTY CLAY sandy, trace gravel, brown, damp  (GLACIAL TILL)  2 SS GR.SA.SI.CL 6.23.46.25 0	0.0 150mm TOPSOIL	EEE																
2 SS GR.SA.SICL 6 23.46.25	0.2 SILTY CLAY sandy, trace gravel, brown, damp			SS										0				
	A CONTROL SOLVESTON V		2	ss										0				
1.8 End of Borehole			3	ss										o				

Borehole was open and dry upon completion of drilling.

Sheet 1 of 1

### **LOG OF BOREHOLE 32**

PROJECT: _	Dixie Road Improvements	COORDINATES:		DATE:	October 10, 2008
LOCATION:	Brampton, Ontario	EQUIPMENT:	Pionjar		
CLIENT:	AECOM	ELEVATION DAT	TUM:n/a	FILE: _	1-10-5140

	SOIL PROFILE		3	SAMF	LES	ALE	PENE RESIS	TRATIC	ON E PLOT	$\geq$			PLAST	IC NAT	URAL	LIQUID	S 8	STANDPIPE
ELEV	DESCRIPTION  Ground Surface	STRAT PLOT	NUMBER	TYPE	"N" VALUES	ELEVATION SCALE	SHEA O UI	R ST NCONF	0 6 RENG	0 8 TH kF + ×	Pa FIELD LAB V	VANE	MA.	TER CO	w OMTEN	WL WL T (%)	G ORGANIC	INSTALLATION OR REMARKS
0.0	200mm TOPSOIL	<u> 253</u>	П							20								
0.2	FILL - Silty Clay, trace sand, trace gravel, trace organics, brown, damp		1	ss										9	•			
0.6	SILTY CLAY sandy, trace gravel, brown, damp (GLACIAL TILL)		2	ss									,	•				
			3	ss										o				
1.8	End of Borehole																	

## **LOG OF BOREHOLE 33**

PROJECT:	Dixie Road Improvements	COORDINATES:	DATE:	October 10, 2008
LOCATION:	Brampton, Ontario	EQUIPMENT: Pionjar		
CLIENT:	AECOM	ELEVATION DATUM: n/a	FILE:	1-10-5140

20 40 60 80 100 LIMIT CONTENT LIMIT ROOF OR OR	DESCRIPTION  DESCR		CLIENT: AECOM	7.0							T OW:							ILL	1-10-5	140
0.0 230mm TOPSOIL  0.2 FILL - Sand and Gravel, trace silt, brown, dry  0.6 FILL - Silty Clay, trace sand, trace gravel, trace to some organics, brown / dark brown, damp to moist dark brown / grey  1.5 SILTY CLAY - trace sand, brown, damp (GLACIAL TILL)	Co. 230mm TOPSOIL  Oz. FILL - Saind and Gravel, trace silt, brown, dry  Os. FILL - Slity Clay, trace sand, trace gravel, trace to some organics, brown / dark brown, damp to moist		SOIL PROFILE			SAMP	LES	ALE	PENE	TRATIC	ON E PLOT	>			PLAST	IC NATI	URAL.	LIQUID	S €	STANDPIPE
0.0 230mm TOPSOIL  0.2 FILL - Sand and Gravel, trace silt, brown, dry  0.6 FILL - Silty Clay, trace sand, trace gravel, trace to some organics, brown / dark brown, damp to moist	0.6 230mm TOPSOIL 0.2 FILL - Sand and Gravel, trace sail, brown, day 0.6 FILL-Silty Clay, trace sand, trace gravel, trace to some organics, brown / dark brown, damp to moist —— dark brown, damp (GLACIAL TILL) 1.5 SILTY CLAY-trace sand, brown, damp (GLACIAL TILL) 1.6 End of Borehole	ELEV DEPTH		STRAT PLOT	NUMBER	TYPE	"N" VALUES	ELEVATION SC	SHEA O U	AR ST NCONF	RENG INED PEN.	TH kP + ×	a FIELD LAB V	VANE ANE	MA.	TER CO	W O ONTEN	₩ _L T (%)		
trace silt, brown, dry  0.6 Fill - Silty Clay, trace sand, trace gravel, trace to some organics, brown / dark brown, damp to moist  dark brown / grey  3 SS	trace silt, brown, dry  O.6. FILL Silty Clay, trace sand, trace gravel, trace to some organics, brown / dark brown, damp to moist	0.0		===							200									
trace silt, brown, dry  0.6 FILL - Silty Clay, trace sand, trace gravel, trace to some organics, brown / dark brown, damp to moist	trace silt, brown, dry  O.6. FILL Silty Clay, trace sand, trace gravel, trace to some organics, brown / dark brown, damp to moist		230Hill FOI SOIL																	
0.6 FILL - Silty Clay, trace sand, trace gravel, trace to some organics, brown / dark brown, damp to moist dark brown / grey  1.5 SILTY CLAY - trace sand, brown, damp (GLACIAL TILL)	FILL - Sitry Clay, trace sand, trace gravel, trace to some organics, brown / dark brown, damp to moist	0.2	trace silt, brown, dry		1	SS									0					
1.5 SILTY CLAY - trace sand, brown, damp (GLACIAL TILL)	1.5 SILTY CLAY-trace sand, brown, damp (GLACIAL TILL)  1.8 End of Borehole	0.6	FILL - Silty Clay, trace sand, trace gravel, trace to some organics, brown / dark brown, damp to moist		2	SS												o		
1.5 SILTY CLAY - trace sand, brown, damp (GLACIAL TILL)	1.5 SLTY CLAY-trace sand, brown, damp (GLACIAL TILL)  1.8 End of Borehole		•		3	ss														
20.23	1.8 End of Borehole	1.5	brown, damp																	
		1.8	THAT SHE SOCIALITY OF SHAPE AND	*444	$\vdash$				-	_							_			

Borehole was open and dry upon completion of drilling.

Sheet 1 of 1

### **LOG OF BOREHOLE 34**

PROJECT:	Dixie Road Improvements	COORDINATES:		DATE:	October 15, 2008
LOCATION:	Brampton, Ontario	EQUIPMENT:	Bombardier/Solid Stem Augers		
CLIENT:	AECOM	ELEVATION DAT		FILE:	1-10-5140

	SOIL PROFILE			SAME	PLES	Щ	PEN	STANC	ON E PLOT					, r		_	0	
	DESCRIPTION  Ground Surface	STRAT PLOT	NUMBER	TYPE	"N" VALUES	ELEVATION SCALE	SHE	AR ST INCON	RENG FINED FPEN.	50 TH kP + ×	a FIELD LAB V	VANE	W _P	TER CO	W O ONTEN	LIQUID LIMIT WL T (%)	GORGANIC VAPOUR	STANDPIPE INSTALLATION OR REMARKS
217:5					1000													W N
0.2	FILL - Silty Clay, trace sand, trace gravel, stiff to very stiff, brown, damp to moist		2	SS	8 10	217								0				
214.8			4	ss	19	215								0				Ţ
2.9	SAND AND SILT trace clay, trace to some gravel, occasional cobbles, very dense, brown, damp to moist (GLACIAL TILL)		5	SS	58	214	GI 11	SA.SI .43.42.	CL	/				o				
	 grey		7	SS	50/13cr	1							0					
	g. 5,			55	50/3cm	213								0				
			8	SS	50/5cm	212							٥					
210.8 6.9 210.0	uace siit,			ee .	50/5cm	211			on in comme									
7.7	End of Borehole  Piezometer Installation consists of 19mm diameter, schedule 140 POC pipe enclosed in filler sand.  Water Level Readings:  Date Depth(m) Elevation(m)  Nov.19.08 2.7 215.0 Dec.01.08 2.6 215.1		9	SS	50/5cm	210	Ÿ						0					

Wet cave at 3.4m (Elev. 214.3m) upon completion of drilling.

Sheet 1 of

### **LOG OF BOREHOLE 10-1**

PROJECT:	Dixie Road Improvements	COORDINATES:		DATE:	July 26, 2010
LOCATION:	Brampton, Ontario	EQUIPMENT:	Solid Stem Augers		
CLIENT:	AECOM	ELEVATION DA	TUM: _n/a	FILE: _	1-10-5140

	SOIL PROFILE			SAMF	PLES	ILE .	PENE	TRATIC	ON E PLOT	>			DIACT	IC NATI	URAL	LIOUID	<u>∪</u> «	STANDPIPE
ELEV DEPTH	DESCRIPTION  Ground Surface	STRAT PLOT	NUMBER	TYPE	"N" VALUES	ELEVATION SCALE	SHEA O UI	AR ST NCONF	RENG INED PEN.	TH kP + ×	a FIELD LAB V	VANE	WA. WP	TER CO	w O ONTEN	LIQUID LIMIT W L T (%)	dd ORGANIC	INSTALLATION OR REMARKS
0.0	930mm FILL - Gravelly Sand, trace silt, very dense, brown, damp		1	ss	50/13cr	1.							o					
					-					/								
0.9	FILL - Silty Clay, some sand, trace gravel, trace organics, stiff to hard, brown, damp to moist		2	SS	57			/					0					
			3	SS	10			SA.SI						o		-1		
1.8	End of Borehole																	

NOTES:

### **LOG OF BOREHOLE 10-2**

PROJECT:	Dixie Road Improvements	COORDINATES:		DATE:	July 26, 2010
LOCATION:	Brampton, Ontario	EQUIPMENT:	Solid Stem Augers		
CLIENT:	AECOM	ELEVATION DAT	ΓUM: _n/a	FILE: _	1-10-5140

Г	SOIL PROFILE		7 3	SAMP	LES	ш	PENE	TRATIC	N					1.0000			1-10-0	
ELEV DEPTH		STRAT PLOT	NUMBER	TYPE	"N" VALUES	ELEVATION SCALE	SHEA O UI	AR STI	RENG INED PEN.	0 8 TH kP + ×	0 1 a FIELD LAB V	VANE ANE	WA-	TER CO	w OMTEN	2500000000	ORGANIC S VAPOUR	STANDPIPE INSTALLATION OR REMARKS
0.0	Ground Surface		1	SS	41		GF	3.SA.SI		0 8	0 1	00	0	0 2	20 3	30		
0.7	FILL - Silty Clay, trace to some sand, trace gravel, stiff, brown, damp to moist		2	SS	13			/						0				
			3	SS	11											o		
NO1																		

NOTES:

### **LOG OF BOREHOLE 10-3**

PROJECT:	Dixie Road Improvements	COORDINATES:	DATE:	July 26, 2010
LOCATION:	Brampton, Ontario	EQUIPMENT: Solid Stem Augers		
CLIENT:	AECOM	ELEVATION DATUM: _ n/a	FILE:	1-10-5140

SOIL PROFILE  SAMPLES  DESCRIPTION  DESCRIPTION  OF SILTY CLAY trace to very dense, brown, damp to moist (GLACIAL TLL)  2 SS 32  End of Borehole  SAMPLES  PARTICLE SAMPLES  DESCRIPTION  D										I OIVI:						- 0.5	70 X 3 4 3 -	1-10-5	
Os ItSmm ASPHALT  Oz 735mm Filt Sand and Gravel, trace sill, dense to very dense, brown, damp  Os Sil.TY CLAY trace to some sand, trace gravel, very silff to hard, brown, damp to moist (GLACIAL TILL)  3 SS 27		SOIL PROFILE			SAMP	LES	CALE							PLAST	IC NATI	URAL	LIQUID	NIC	
0.0 155mm ASPHALT  0.2 735mm FILL - Sand and Gravel, trace sill, dense to very dense, brown, damp  0.9 SILTY CLAY trace to some sand, trace gravel, very silff to hard, brown, damp to moist (GLAC/AL TILL)  3 SS 27	ELEV DEPTH	la contract	STRAT PLOT	NUMBER	TYPE	"N" VALUES	ELEVATION SO	SHEA O UI	AR STI	RENG INED PEN.	TH kP + ×	a FIELD LAB V	VANE ANE	MA.	TER CO	w OMTEN	₩ _L T(%)		OR
0.2 735mm FiLL - Sand and Gravel, trace silt, dense to very dense, brown, damp  1 SS 50/10cm  0.9 SiLTY CLAY trace to some sand, trace gravel, very stiff to hard, brown, damp to moist (GLACIAL TILL)  3 SS 27	0.0			Н						-			Ç-In						
sill Ty CLAY trace to some sand, trace gravel, very stiff to hard, brown, damp to moist (GLACIAL TILL)  3 SS 27	0.2	735mm FILL - Sand and Gravel, trace silt,		1	ss	50/10cr	n												
1.8 End of Borehole	0.9	trace to some sand, trace gravel, very stiff to hard, brown, damp to moist		2	ss	32									o				
				3	SS	27									0				
	1.8	End of Borehole																	
											×								

### **LOG OF BOREHOLE 10-4**

PROJECT: _	Dixie Road Improvements	COORDINATES:		DATE:	July 26, 2010
LOCATION:	Brampton, Ontario	EQUIPMENT:	Solid Stem Augers		
CLIENT:	AECOM	ELEVATION DAT	TUM:n/a	FILE: _	1-10-5140

	SOIL PROFILE		SAMF	ol Ec	_	PENET	RATIC	N		_	-				-	1-10-0	
	TALL TO SERVICE AND ADDRESS OF THE PARTY OF		SAIVIF		CALE	RESIST	ANCE	PLOT				PLAST	IC NATI	URAL TURE	LIQUID LIMIT	NIC	STANDPIPE INSTALLATION
ELEV DEPTH	S E	NUMBER	TYPE	"N" VALUES	ELEVATION SCALE	SHEAF O UNI	R STI CONF	INED	TH kP + ×	FIELD LAB V	VANE	MA.	TER CO	ONTEN	w _L	d ORGANIC S VAPOUR	OR REMARKS
0.	Ground Surface  135mm ASPHALT					1			,	Ť		-			Ĭ		
0.		1	ss	50/13cr	n							o					
		2	ss	100/28c	m					/	/	0					
1.	SILTY CLAY trace to some sand, trace gravel, very stiff, brown, damp to moist (GLACIAL TILL)	3	ss	29			/		/				0				
1.3	End of Borehole																

NOTES

# 333

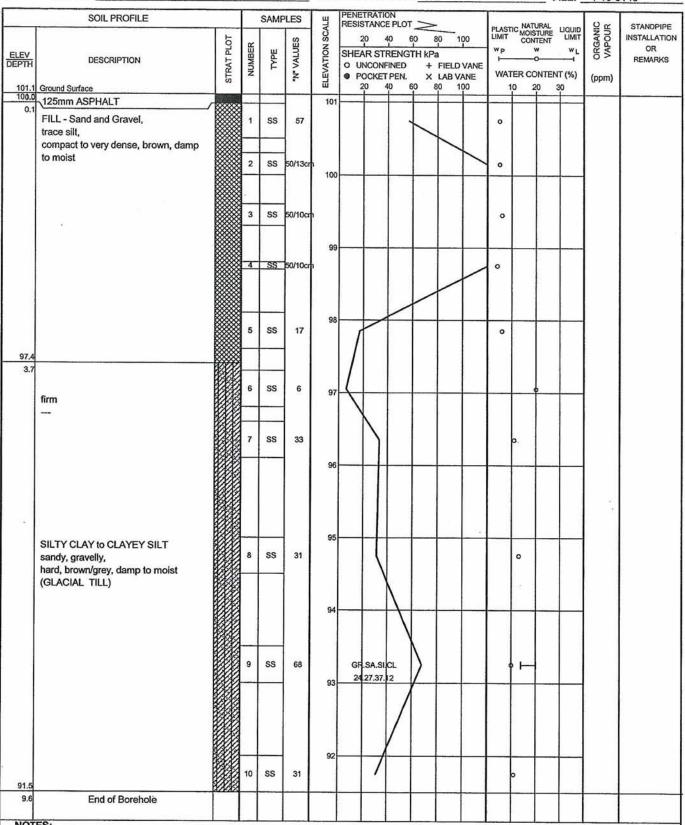
### Terraprobe

### **LOG OF BOREHOLE 10-5**

 PROJECT:
 Dixie Road Improvements
 COORDINATES:
 DATE:
 July 26, 2010

 LOCATION:
 Brampton, Ontario
 EQUIPMENT:
 Solid Stem Augers

 CLIENT:
 AECOM
 ELEVATION DATUM:
 n/a
 FILE:
 1-10-5140



NOTES:

Wet cave at 3.7m upon completion of drilling. No sample recovery in SS8. Disturbed sample collected.

### **LOG OF BOREHOLE 10-6**

PROJECT:	Dixie Road Improvements	COORDINATES:		DATE:	July 26, 2010
LOCATION:	Brampton, Ontario	EQUIPMENT: _	Solid Stem Augers		
CLIENT:	AECOM	ELEVATION DA	TUM: n/a	FILE:	1-10-5140

	COIL PROFILE	_	_	SAMF	LEC		PENE	TRATIC	N			-	-7.2				1-10-5	
	SOIL PROFILE		-	SAME		CALE	RESIS	TANCE	PLOT				PLAST	IC NATI	URAL TURE	LIQUID LIMIT	NIC	STANDPIPE INSTALLATION
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	ELEVATION SCALE	SHEA O UI	R STI		TH kP	FIELD	VANE	w _p	CON TER CO	<b>~</b>	₩L	ORGANIC	OR REMARKS
	Ground Surface	ST	_		ž	EE		OCKET 0 4	PEN. 0 6		LAB V	ANE 00				30	(ppm)	
0.0	20mm TOPSOIL	7/ /																
		17.311,																
0.2	620mm FILL - Sand and Gravel, trace silt, compact, brown, moist		1	SS	12								0					
	PA																	
0.8	FILL - Silty Clay, some sand to sandy, trace gravel, stiff to very stiff, brown/grey, damp to moist		2	ss	10		$  \langle $							,				
	AAAAAAAA		3	ss	28			\						0				
1.8	End of Borehole																	
NOT																		

NOTES:

Borehole was dry (not stabilized) and hole open to full depth on completion. No sample recovery in SS2 and SS 3. Disturbed sample collected from augers.

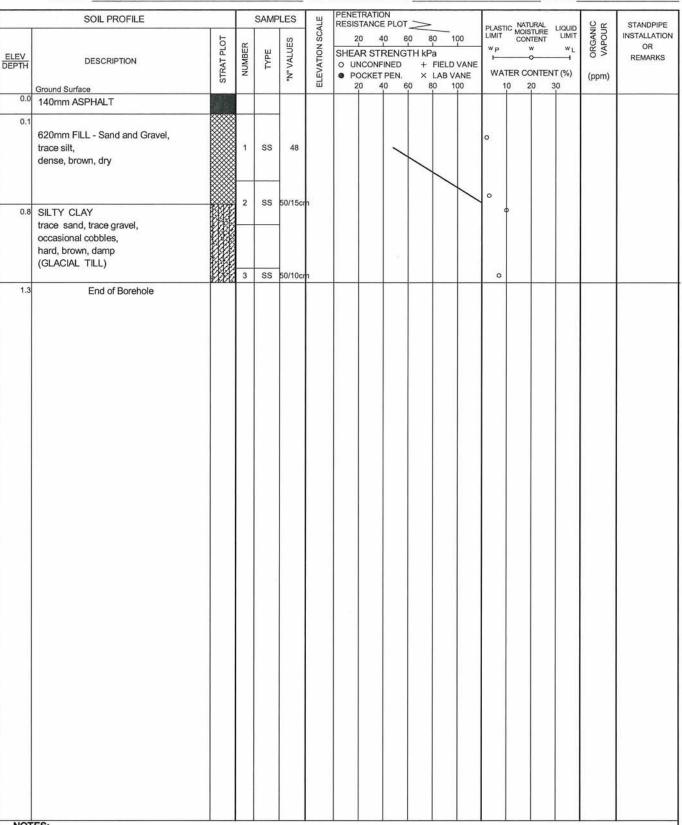
### **LOG OF BOREHOLE 10-7**

PROJECT:	Dixie Road Improvements	COORDINATES:	DATE:	July 26, 2010
LOCATION:	Brampton, Ontario	EQUIPMENT: Solid Stem Augers		
CLIENT:	AECOM	ELEVATION DATUM: _ n/a	FILE:	1-10-5140

20 40 60 80 100 LIMIT CONTENT LIMIT VOISTURE LIMIT		CLIENT: AECOM					ELE			TUM:	n/a	1				_ F	ILE: _	1-10-5	140
0.0 150mm ASPHALT  0.2 440mm FILL -Sand and Gravel, some silt, very dense, brown, damp  1 SS 75  GR.SA.SI & CL 43.46 .11  0.6 FILL - Silty Clay, trace to some sand, trace gravel, trace organics, very stiff, dark brown/black, damp to moist damp to moist (GLACIAL TILL)  0.9 SILTY CLAY, trace to some sand, trace gravel, very stiff to hard, brown, damp to moist (GLACIAL TILL)		SOIL PROFILE			SAMP	LES	ALE	RESIS	STANCE	E PLOT				PLAST	IC NATI	URAL	LIQUID	일본	STANDPIPE
0.0 150mm ASPHALT  0.2 440mm FILL -Sand and Gravel, some silt, very dense, brown, damp  1 SS 75  GR.SA.SI & CL 43.46.11  0.6 FILL - Silty Clay, trace to some sand, trace gravel, trace organics, very stiff, dark brown/black, damp to moist  0.9 SILTY CLAY, trace to some sand, trace gravel, very stiff to hard, brown, damp to moist (GLACIAL TILL)  3 SS 30			STRAT PLOT	NUMBER	TYPE	"N" VALUES	ELEVATION SC	SHE/ O U • P	AR ST NCONF OCKET	RENG INED PEN.	TH kP + ×	a FIELD LAB V	VANE ANE	WA.	TER CO	w O ONTEN	w L T (%)		INSTALLATION OR REMARKS
silt, very dense, brown, damp  1 SS 75  GR.SA.SI&CL 43.46.11  0 o  0 FILL - Silty Clay, trace to some sand, trace gravel, trace organics, very stiff, dark brown/black, damp to moist  0.9 SILTY CLAY, trace to some sand, trace gravel, very stiff to hard, brown, damp to moist (GLACIAL TILL)  3 SS 30										giid vie									
trace gravel, trace organics, very stiff, dark brown/black, damp to moist  0.9 SILTY CLAY, trace to some sand, trace gravel, very stiff to hard, brown, damp to moist (GLACIAL TILL)  3 SS 30				1	SS	75					/			0					
0.9 SILTY CLAY, trace to some sand, trace gravel, very stiff to hard, brown, damp to moist (GLACIAL TILL)  3 SS 30	tra	race gravel, trace organics, very stiff,		~											0				
	gra	ravel, very stiff to hard, brown, damp to		2	55	19									0				
1.8 End of Borehole				3	ss	30									o				
	1.8	End of Borehole	XXX	-	$\vdash$														

### **LOG OF BOREHOLE BD1**

PROJECT:	Dixie Road Improvements	COORDINATES		DATE:	October 10, 2008
LOCATION:	Brampton, Ontario	EQUIPMENT:	Solid Stem Augers		
CLIENT:	AECOM	ELEVATION DA	TUM: _n/a	FILE: _	1-10-5140



NOTES:

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# Terraprobe

### **LOG OF BOREHOLE CD1**

PROJECT: _	Dixie Road Improvements	COORDINATES:		DATE:	October 09, 2008
LOCATION:	Brampton, Ontario	EQUIPMENT: _	Solid Stem Augers		
CLIENT:	AECOM	ELEVATION DAT	TUM: _n/a	FILE: _	1-10-5140

	SOIL PROFILE			SAMP	LES	ALE	PENET RESIS	TANCE	N PLOT	>	y		PLAST	IC NAT	URAL	LIQUID	일본	STANDPIPE
ELEV DEPTH	DESCRIPTION  Ground Surface	STRAT PLOT	NUMBER	TYPE	"N" VALUES	ELEVATION SCALE	SHEA O UN • PC	R STE	RENG'	TH kP + ×		VANE ANE	MA.	TER CO	w o ONTEN	WL T (%)	dd ORGANIC	INSTALLATION OR REMARKS
0.0	165mm ASPHALT																	
0.2	470mm FILL - Sand and Gravel, trace silt, compact, brown, damp		1	ss	22			ı					o					
0.6	SILTY CLAY trace to some sand, trace gravel, stiff to very stiff, brown, damp to moist (GLACIAL TILL)		2	ss	14									o				
			3	SS	21			Ğ						o				
1.8	End of Borehole	193368																

NOTES

### **LOG OF BOREHOLE HB1**

PROJECT:	Dixie Road Improvements	COORDINATES:		DATE:	October 14, 2008
LOCATION:	Brampton, Ontario	EQUIPMENT:	Solid Stem Augers		
CLIENT:	AECOM	ELEVATION DAT	ΓUM: _n/a	FILE: _	1-10-5140

	SOIL PROFILE			SAMP	LES	ALE	RESIS		E PLOT			PLAST LIMIT	IC NATI	URAL	LIQUID LIMIT	일	STANDPIPE
ELEV DEPTH	DESCRIPTION  Ground Surface	STRAT PLOT	NUMBER	TYPE	"N" VALUES	ELEVATION SCALE	SHEA O UI	AR STI		TH kF + ×	ANE	W _P	TER CO	W OMTEN	w _L	G ORGANIC S VAPOUR	INSTALLATION OR REMARKS
0.0	140mm ASPHALT	100										£.					
0.1	660mm FILL - Sand, trace to some gravel, trace silt, brown, dry		1	AS								0					
3.0	SAND AND SILT trace to some clay, brown, damp		2	AS								¢	Þ				
1.5	* SPT testing equipment broken. Auger samples collected.	B 503.5												41			

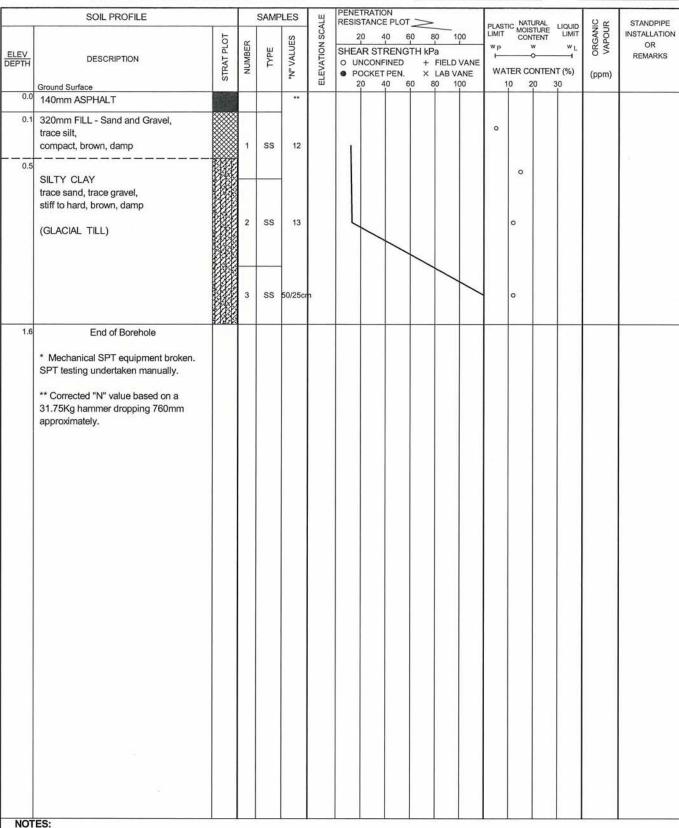
### **LOG OF BOREHOLE MR1**

PROJECT:	Dixie Road Improvements	COORDINATES:	DATE:	October 09, 2008
LOCATION:	Brampton, Ontario	EQUIPMENT: Solid Stem Augers		104
CLIENT:	AECOM	ELEVATION DATUM: _ n/a	FILE:	1-10-5140

	SOIL PROFILE			SAMP	LES	ш	PENE	TRATIC	ON		-		Г	_	-			7
	OOIL I NOT ILL	-		JAIVIE		ELEVATION SCALE	RESIS	TANC	E PLOT			00	PLAST LIMIT	IC NATI MOIS CON	TURE	LIQUID LIMIT	ORGANIC	STANDPIPE INSTALLATION
FLEV		STRAT PLOT	NUMBER	й	"N" VALUES	NO NO			RENG		1	Ÿ.	w _p	,	W	wL	ORG	OR REMARKS
ELEV DEPTH	DESCRIPTION	RAT	Z C W	TYPE	- VA	VAT	O U	NCONF	INED	+	FIELD	VANE		TER CO	NTEN	T (%)		REMARKS
	Ground Surface	S	_		Į Ž	E			PEN.		LAB V	OO				30	(ppm)	
0.0	260mm ASPHALT																	
			ı															
0.3		***																
	550mm FILL - Gravel and Sand,		1	ss	38			١,					0					
	trace silt, dense, brown, dry							/					*****			1		
	dense, brown, dry	₩						/					0					
							/											
0.8		₩	2	SS	8		1											
	FILL - Silty Clay, trace sand, trace gravel,	₩					1											
	trace organics,													0				
	stiff to very stiff, grey, damp to moist						1											
		₩	3	ss	16		1								•			
		₩																
		₩													0			
	G G						1 1											
		₩	4	ss	14		1											
		₩																
2.3	SILTY CLAY - trace sand, trace gravel,	M												٥				
	inferred very stiff, grey, damp																	
2.4	End of Borehole																	
																	Y	
18																		
	750																	
NOT	ES:																	

### LOG OF BOREHOLE NP1

PROJECT:	Dixie Road Improvements	COORDINATES:		DATE:	October 14, 2008
LOCATION:	Brampton, Ontario	EQUIPMENT:	Manual SPT	7) ::	
CLIENT:	AECOM	ELEVATION DAT	'UM: _n/a	FILE:	1-10-5140



# 355

## Terraprobe

### **LOG OF BOREHOLE PR1**

PROJECT:	Dixie Road Improvements	COORDINATES:		DATE:	October 14, 2008
LOCATION:	Brampton, Ontario	EQUIPMENT:	Solid Stem Augers		
CLIENT:	AECOM	ELEVATION DAT	TUM: _n/a	FILE:	1-10-5140

	SOIL PROFILE			SAMP	LES	ALE	RESIS	TRATIC	PLOT	2			PLAST	IC NATI	URAL	LIQUID	을 뚝	STANDPIPE
ELEV DEPTH	DESCRIPTION  Ground Surface	STRAT PLOT	NUMBER	TYPE	"N" VALUES	ELEVATION SCALE	SHEA O U	AR STI NCONF OCKET	RENG	TH kP + ×	FIELD LAB V	VANE	WA.	TER CO	w O ONTEN	w _L	d ORGANIC  WAPOUR	INSTALLATION OR REMARKS
0.0	115mm ASPHALT																	
0.1	365mm FILL - Sand and Gravel, trace silt, dense, brown, damp	6327	1	ss	39								0					
0.5	SILTY CLAY trace to some sand, trace gravel, very stiff, brown, damp (GLACIAL TILL)		2	SS	21								0	o				
			3	SS	26									•				
1.8	End of Borehole	- XIXA																

Borehole was open and dry upon completion of drilling.

Sheet 1 of 1

### **LOG OF BOREHOLE SP1**

PROJECT:	Dixie Road Improvements	COORDINATES:		DATE:	October 10, 2008
LOCATION:	Brampton, Ontario	EQUIPMENT:	Solid Stem Augers		
CLIENT:	AECOM	ELEVATION DA	ΓUM: _n/a	FILE: _	1-10-5140

SOIL PROFILE	RESISTANCE PLOT   20   40   60   80   100   20   30   60   80   100   20   30   60   80   100   20   30   60   80   100   20   30   60   80   100   20   30   60   80   100   20   30   60   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   100   80   10		CLIENT: AECOM					ELE			( I UIVI:	_11/2	1	_			— r	ILE: _	1-10-5	140
Ground Surface  110mm ASPHALT  1470mm FILL - Gravel, some sand, trace silt, dense, brown, dry  1 SS 44  SILTY CLAY trace sand, trace gravel, very stiff to hard, brown, damp  (GLACIAL TILL)  3 SS 25	O.0 110mm ASPHALT  0.1 470mm FILL - Gravel, some sand, trace silt, dense, brown, dry  0.6 SILTY CLAY trace sand, trace gravel, very stiff to hard, brown, damp  (GLACIAL TILL)  3 SS 25		SOIL PROFILE			SAMP	LES	ALE	PENE	TRATIC	ON E PLOT	>			PLAST	IC NATI	JRAL	LIQUID	2 K	STANDPIPE
0.0 110mm ASPHALT  0.1 470mm FILL - Gravel, some sand, trace silt, dense, brown, dry  0.6 SILTY CLAY trace sand, trace gravel, very stiff to hard, brown, damp  (GLACIAL TILL)  3 SS 25	O.0 110mm ASPHALT O.1 470mm FILL - Gravel, some sand, trace silt, dense, brown, dry  O.6 SILTY CLAY trace sand, trace gravel, very stiff to hard, brown, damp  (GLACIAL TILL)  3 SS 25	ELEV DEPTH	And the second s	STRAT PLOT	NUMBER	TYPE	"N" VALUES	ELEVATION SC	SHEA O U	AR ST	RENG INED PEN.	TH kP + ×	a FIELD LAB V	VANE ANE	W _P	TER CO	N ONTEN	₩ _L T(%)	1	OR
0.1 470mm FILL - Gravel, some sand, trace silt, dense, brown, dry  1 SS 44  SILTY CLAY trace sand, trace gravel, very stiff to hard, brown, damp  (GLACIAL TILL)  3 SS 25	0.1 470mm FILL - Gravel, some sand, trace silt, dense, brown, dry  0.6 SILTY CLAY trace sand, trace gravel, very stiff to hard, brown, damp (GLACIAL TILL)  3 SS 25	0.0	110mm ASPHALT	200	$\vdash$		-		- 25			S				2 50				
SILTY CLAY trace sand, trace gravel, very stiff to hard, brown, damp  (GLACIAL TILL)  3 SS 25	SILTY CLAY trace sand, trace gravel, very stiff to hard, brown, damp  2 SS 36  (GLACIAL TILL)  3 SS 25	0.1	470mm FILL - Gravel, some sand, trace silt, dense, brown, dry		1	ss	44				/				o					
			SILTY CLAY trace sand, trace gravel, very stiff to hard, brown, damp		2	ss	36								o					
1.8 End of Borehole	1.8 End of Borehole				3	SS	25								0	2014				

Borehole was open and dry upon completion of drilling.

Sheet 1 of 1



### **LOG OF BOREHOLE WP1**

PROJECT:	Dixie Road Improvements	COORDINATES:		DATE:	October 14, 2008
LOCATION:	Brampton, Ontario	EQUIPMENT:	Solid Stem Augers		
CLIENT:	AECOM	<b>ELEVATION DAT</b>	'UM: _n/a	FILE: _	1-10-5140

	SOIL PROFILE		SAME	PLES	ALE:	RESIS		PLOT				PLASTI LIMIT	C NATI	JRAL	LIQUID LIMIT	일목	STANDPIPE
ELEV DEPTH	DESCRIPTION Ground Surface	NUMBER	TYPE	"N" VALUES	ELEVATION SCALE	SHEA O UI	R STI		ΓΗ kP: + ×	0 10 a FIELD LAB VA	VANE ANE	W P WAT	ER CO	N ONTEN	₩L	d ORGANIC	INSTALLATION OR REMARKS
0.0	135mm ASPHALT																
0.1	trace to some gravel, trace silt, compact, brown, damp	1	ss	16		1						0					
0.5	FILL - Silty Clay, trace sand, trace gravel, trace organics, inferred very stiff, grey, damp to moist	2	SS	19								X	0	<b>.</b>			
1.0	SILTY CLAY trace sand, trace gravel, inferred very stiff, brown, damp to moist (GLACIAL TILL)	3	AS										0				
1.5	End of Borehole																

# **APPENDIX B**

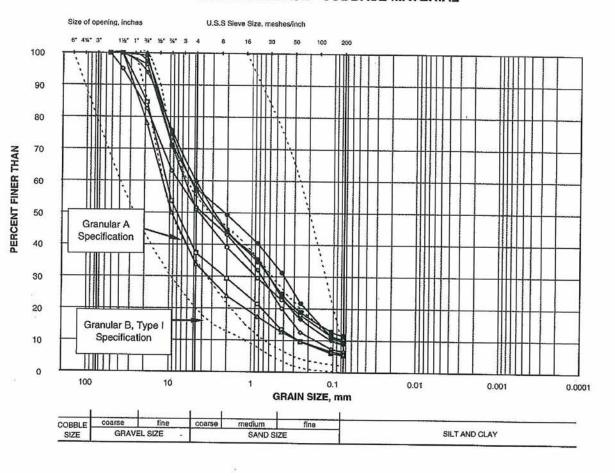
TERRAPROBE INC.



### **GRAIN SIZE DISTRIBUTION**

FIGURE B1

### **GRANULAR BASE - SUBBASE MATERIAL**



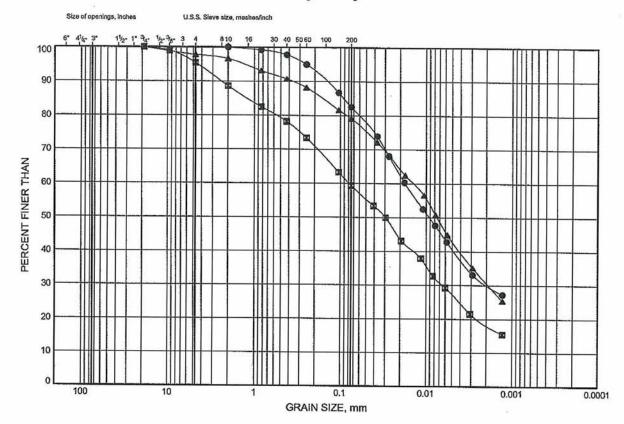
SYMBOL	BOREHOLE	GRAVEL	SAND	SILT & CLAY
. = 11724				5,2,4,021
•	3	49%	41%	10%
•	7	48%	46%	6%
	15	63%	32%	5%
<b>A</b>	23	66%	28%	6%
•	27	42%	49%	9%
•	10-2	40%	51%	9%
	10-7	43%	46%	11%

Date: August 2010 Project: 1-09-4136

### FIGURE B2

### **GRAIN SIZE DISTRIBUTION**

### FILL - Silty Clay



- I			Ē		1	
COBBLE	COARSE	FINE	COARSE	MEDIUM	FINE	SILT and CLAY
SIZE	GRA	VEL		SAND		FINE GRAINED

SYMBOL	BOREHOLE	DEPTH (m)	ELEVATION (m)
•	4	0.9	
<b>12</b> 0	15	0.9	
<b>A</b>	10-1	1.5	

Date August 2010 Project 1-10-5140

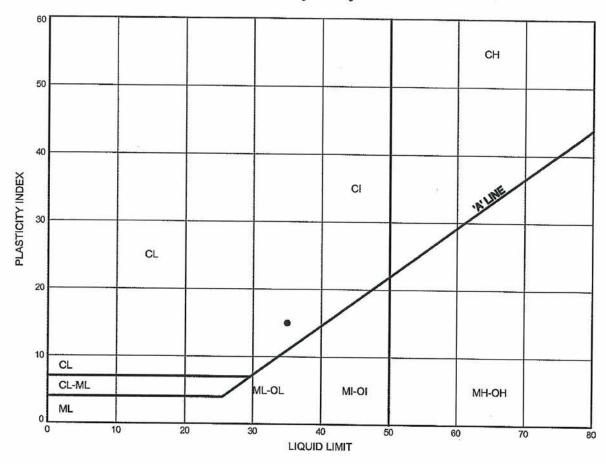


Prep'd ... K.L.

### ATTERBERG LIMITS TEST RESULTS

FIGURE B3

FILL - Silty Clay



SYMBOL BOREHOLE DEPTH (m) ELEVATION (m)

10-1 1.5

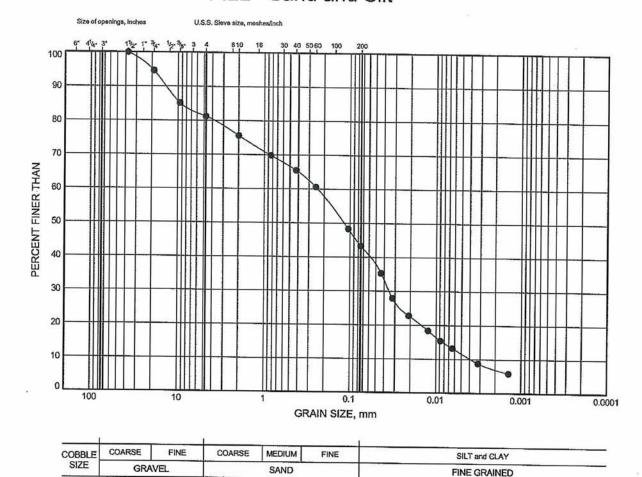
Date August 2010
Project 1-10-5140



# **GRAIN SIZE DISTRIBUTION**

FIGURE B4

### FILL - Sand and Silt



SYMBOL	BOREHOLE	DEPTH (m)	ELEVATION (m)
	14	0.0	

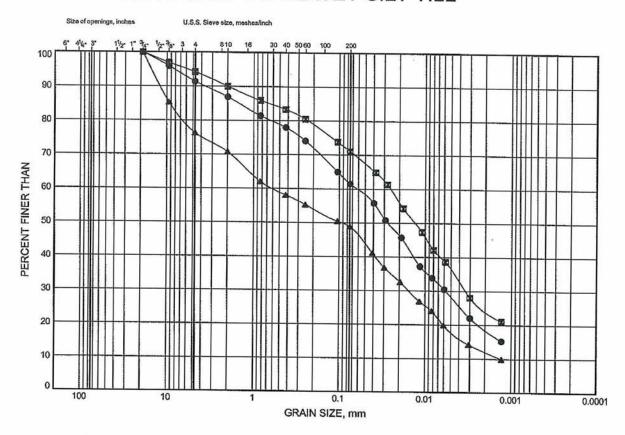
Date August 2010
Project 1-10-5140



### **GRAIN SIZE DISTRIBUTION**

FIGURE B5

## SILTY CLAY TO CLAYEY SILT TILL



COBBLE	COARSE	FINE	COARSE	MEDIUM	FINE	SILT and CLAY
SIZE	GRA	VEL		SAND	TOTAL SECTION AND ADDRESS OF THE PARTY OF TH	FINE GRAINED

SYMBOL	BOREHOLE	DEPTH (m)	ELEVATION (m)
•	1	1.5	
02	30	0.9	
<b>A</b>	10-5	7.9	93.3

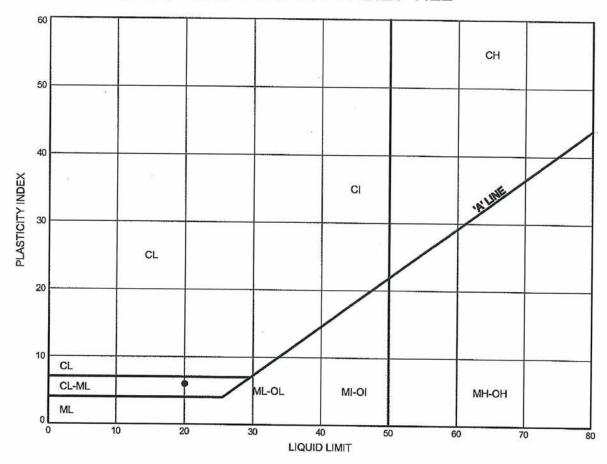
Date August 2010
Project 1-10-5140



### ATTERBERG LIMITS TEST RESULTS

FIGURE B6

### SILTY CLAY TO CLAYEY SILT TILL



SYMBOL	BOREHOLE	DEPTH (m)	ELEVATION (m)
•	10-5	7.9	93.3

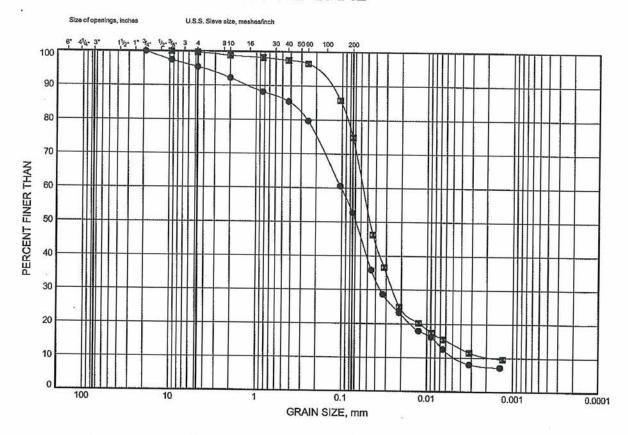
Date August 2010
Project 1-10-5140



# **GRAIN SIZE DISTRIBUTION**

FIGURE B7

### SILT AND SAND



			1				
COBBLE	COARSE	FINE	COARSE	MEDIUM	FINE	SILT and CLAY	
SIZE	GRA	VEL		SAND		FINE GRAINED	_

SYMBOL	BOREHOLE	DEPTH (m)	ELEVATION (m)
•	19	1.5	
02	29	1.5	

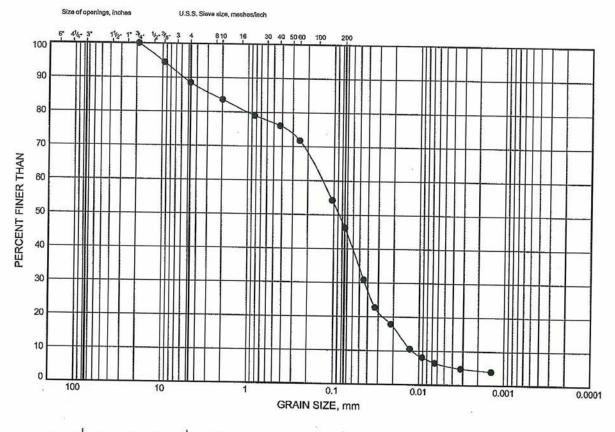
Date August 2010 Project 1-10-5140



### **GRAIN SIZE DISTRIBUTION**

FIGURE B8

### SAND AND SILT TILL



December 1915					
COARSE	FINE	COARSE	MEDIUM	FINE	SILT and CLAY
GRAV	VEL		SAND		FINE GRAINED
	COARSE GRA	COARSE FINE GRAVEL	00711102	The state of the s	CONTROL MEDICINI PINE

SYMBOL	BOREHOLE	DEPTH (m)	ELEVATION (m)
•	34	3.2	214.5

Date August 2010
Project 1-10-5140



Prep'd K.L.
Chkd. M.P.

# **APPENDIX C**

TERRAPROBE INC.

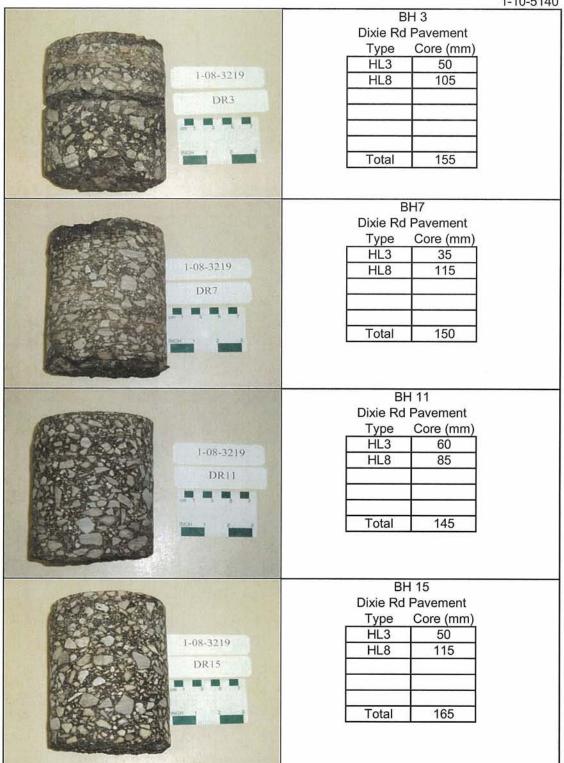




### **Core Photographs**

**Dixie Road Improvements** 

1-10-5140

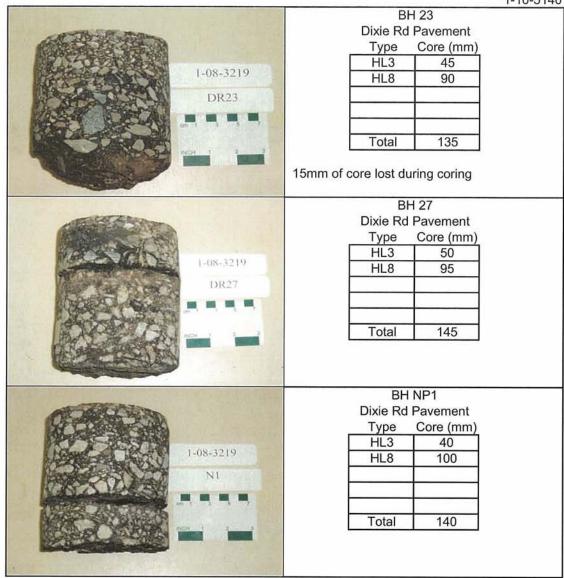




### **Core Photographs**

**Dixie Road Improvements** 

1-10-5140



raffic Direction B  Class A  Class Right  To Sever  Class Right  Distress Right  Right  Pakup and Right  Naintenance  Extent of Occurrence, %  Occurrence, %	Road No. (Street)	t) Dixie Road (Regional Road 4)	nal Ro	ad 4)			Po	Location From	- 12	Sta. 7+800 (N. of Queen Street)	of Queen S	treet)	70	155	Sta. 8+300 (Howden Boulevard)	(Howc	den Bo	uleva	<u>G</u>	-
Riding Condition Rating ( RCR ) 7 Evaluate Several Ratin	Section Length	500 m			km)(	Ê	Sur	vey Date	May	28, 2009	Traffic	Directio		90 W	B: Both Directions, N: North Bound S: South Bound, E: East Bound, W: West Bound	ons, N: I	North Boun	ound d, W:	West Bo	Š
Riding Condition Rating (RCR)  Shoulder Distress  Manifestation  Shoulder Distress  Manifestation  Dominant Cabe of Ca	Confract No.						Wo	rk Project	Š F	-10-5140		Class	⋖	E Z	F: Freeway, C: Connecting Link, A: Major Arterial M: Minor Arterial, R: Residential	: Connec	cting Linl esidentia	κ, Μ	lajor Arte	<u>ia</u>
Shoulder Distress %  Shoulder Distress Manifestation  Manual Patching  Manual Burdening  Manual Burden	Pavement Cond	ition Rating ( PCR )		,	0		Rid	ing Condit	ion Rai	ting (RCR)	7		Eva	luated	By	M. Talukdar, P. Eng.	ukdar,	<u>.</u>	Jd.	
Manual Spray Patching  Manual Burching  Manual Spray Patching  Manual Burching  Manual Burching  Manual Spray Patching  Manual Burching  Manua	Riding	200	<u> </u>	8	everity of		Densi	y of Distress	8 9	Shoul	der Distre	SS	Se	verity	of	Den	Density of Distress, %	f Dis	tress	%
Dominant Coordinate Co	Condition			+			- Invier		6	Mar	Ifestation		ا الم	istres	S	Exte	Extent of Occurrence	8	urren	8
Separation  Separation  Surface  Curb Separation  Paved Shoulde  Full Separation  Paved Shoulde  Surface  Paved Shoulde  Surface  Paved Shoulde  Surface  Cracking  Paved Shoulde  Surface  Paved Shoulde  Surface  Distortion  Pavement Edg  Curb Separation  Manual Patching  Manual Spray Patching  Manual Surface Treatment  Manual Burn & Seal  Surface Treatment  Manual Burn & Seal	Rating	87 S								Dominant			TIGIN	6		Ž   `	gut	-	Lett	-
Paved Paved Paved Paved Should Separation Paved Should Separation Paved Should Surface Potholes Treated Distortion Primed Pavement Edg Pavement Edg Potholes Primed Pavement Edg Pavement Edg Pavement Edg Primed Pavement Edg Pavement	( at posted				əte	,	ttent		θΛI	TYPE		sse	***************************************	sever slight	.bom severe	02>	S0-50	<s0 &gt;20</s0 	S0-50	-
Paved Paved Paved Paved Shoulde Separation Paved Shoulde Separation Partial Breakup and Surface Potholes Treated Distortion Primed Pavement Edg Pave	( peeds			14	neb	919	imi	_	sua				1 2	3 1	2 3	-	2	7-	2	-
Full Paved Shoulds Separation Paved Cracking Partial Breakup and Surface Potholes Treated Distortion Primed Curb Separation Primed Curb Separation Primed Curb Separation Manual Patching Manual Spray Patching Manual Chip Seal Surface Treatment Manual Burn & Seal				Siig	ooM	vəs	ətul	110 100	EXI6	Paved	Pavemen	t Edge		+						$\vdash$
Partial Breakup and Surface Potholes Treated Distortion Primed Curb Separatio  Manual Patching Manual Spray Patching Manual Chip Seal Surface Treatment Manual Burn & Seal	Pavement	Distress Manifestation	+	+			<20	-	20	E E	Paved Shi Separation	oulder								
Partial Breakup and Surface Distortion  Treated Distortion  Primed Curb Separatio  Manual Patching  Machine Patching  Manual Spray Patching  Manual Chip Seal  Fog Seal  Surface Treatment  Manual Burn & Seal				-	7	က	1		8	Paved	Cracking	Ī				H				╀
Surface Potholes Treated Distortion Primed Curb Separatio  Wanual Patching Machine Patching Manual Spray Patching Manual Chip Seal Surface Treatment Manual Burn & Seal		Ravelling	-							Partial	Breakup a	pu	F	-	7	-	t	F		╀
Primed Distortion  Pavement Edg  Curb Separatio  Curb Separatio  Manual Patching  Manual Spray Patching  Manual Chip Seal  Fog Seal  Surface Treatment  Manual Burn & Seal	Surface	Flushing	2							Surface	Potholes									-
Primed Pavement Edge  Curb Separatio  Curb Separatio  Manual Patching  Manual Patching  Manual Spray Patching  Manual Chip Seal  Fog Seal  Surface Treatment  Manual Burn & Seal	Defects	Potholes	3	/			>			Treated	Distortion		F	F	-	ŀ	╁	-		╀
Pavement  Pavement  Manual Patching  Manual Spray Patching  Manual Spray Patching  Manual Chip Seal  Fog Seal  Surface Treatment  Manual Burn & Seal		Pavement Edge Breaks	4	_		TOTAL LABOR					Pavement	Edoe		-		<u> </u>	$\dagger$	1		-
Pavement  Manual Patching  Manual Spray Patching  Manual Spray Patching  Manual Spray Patching  Manual Chip Seal  Fog Seal  Surface Treatment  Manual Burn & Seal			5	_	^		>			Frimed	Curb Sepa	ration						1,777.00		_
Pavement  Manual Patching  Machine Patching  Manual Spray Patching  Manual Spray Patching  Manual Chip Seal  Fog Seal  Surface Treatment  Manual Burn & Seal			9						Γ					-			1			4
Pavement  Manual Patching  Machine Patching  Machine Patching  Machine Patching  Manual Spray Patching  Manual Spray Patching  Manual Chip Seal  Fog Seal  Surface Treatment  Manual Burn & Seal	Surface	ack Rutting	7					1+												
Pavement  Manual Patching  Machine Patching  Machine Patching  Manual Spray Patching  Manual Spray Patching  Manual Chip Seal  Fog Seal  Surface Treatment  Manual Burn & Seal	Deformation		8	/			>		Γ							10000				1
Pavement Occurrence, Pavement Occurrence, V			6				>					Mai	ntena	ce Ti	eatme	ıt				
Pavement Occurrence, Pavement No Nocurrence, No			10		1			>				_	xtent of	F				L	Tutort of	
Manual Burn & Seal			11		`			>	Γ			000	urrence, 9					ő	Occurrence,	%
Manual Patching  Machine Patching  Manual Spray Patching  Manual Chip Seal  Fog Seal  Surface Treatment  Manual Burn & Seal	Cracking	ment Edge Breaks	12	_		`		`		Pav	ement	0	Т	T	Ġ,	Shoulder	7		0	L
Manual Patching  Machine Patching  Manual Spray Patching  Manual Chip Seal  Fog Seal  Surface Treatment  Manual Burn & Seal			13	_				>	Γ			<5(	17.	)G<	j			<50	9-07	05<
Manual Patching  Machine Patching  Manual Spray Patching  Manual Spray Patching  Manual Chip Seal  Fog Seal  Surface Treatment  Manual Burn & Seal			4		/		>		Т			-	t	T @				-	2 0	"
	ć			5						Manual Pa	tching	>			Man	Manual Patching	guin			1
	Distress Comm	ents ( Items not covered	apove							Machine Pa	atching				Manual	Manual Spray Patching	atchina			
	Slight intermitten	t road side curb breaks.								Manual Sp	ray Patching	L			Manu	Manual Chip Seal	Seal			L
									ı	Manual Ch	p Seal				Crack	Crack Rout & Seal	Seal			上
	ſ									Fog Seal			-							L
	Kecommendatio	in by Evaluator							I	Surface Tre	eatment									
	Coo Torron		,	(						Manual Bur	n & Seal									
	סהב ובוומחוחחם	Georgeonnical Report P	éer.	20-	140				I	Crack Rout & Seal	& Seal	>								L

						2	Location From	188	Sta. 8+300 (Howden Boulevard)	owden Bou	levard)	1	<u>م</u>	Sta.	9+500	) (Ma	Sta. 9+500 (Mansion Street)	Stree	ह्र		- 1
Section Length	1,200 m		ı	(km)(	( m ) (	Sur	Survey Date	May 2	May 28, 2009	Traffi	Traffic Direction	-	m	B: Bo S: So	h Direct Ith Bour	lions, 1 nd, E:	B: Both Directions, N: North Bound S: South Bound, E: East Bound, W: West Bound	Boun Und,	ξ Ş σ	est Bor	Pur
Contract No.						Wo	Work Project No. 1-10-5140	No. -1	10-5140		Class		<	F: Fre M: Mi	eway, (	C: Conr ial, R:	F: Freeway, C: Connecting Link, M: Minor Arterial, R: Residential	Link, /	A: Maj	A: Major Arterial	<u>a</u>
Pavement Condition	Pavement Condition Rating ( PCR )			80		Rid	ng Condit	ion Rat	Riding Condition Rating (RCR)		8	ш	valus	Evaluated By	>	ĭ.	M. Talukdar, P. Eng.	ar, P.	Eng	_]	
Riding	Excellent ( smooth )		Se	Severity of Distress		Densit (Extent	Density of Distress % (Extent of Occurrence)	% (eo	Shoul	Shoulder Distress Manifestation	ess		Seve	Severity of Distress	4	e e	Density of Distress, % Extent of Occurrence	of O	Distr	ess,	% 9
Condition	Good ( comfortable )									>	ī.	Rigi	Right		Left		Right	Г		Left	
( at posted	Fair (uncomfortable) Poor (v. roughfammy)			əte	į	ttent		θνί	Dominant	One	Distress	trigita	mod,	alight	severe	<20	20-60	>20	<50	20-50	>20
( peeds	— 2		14	пәр	ere	imi		sua				-	2 3	٧-	2 3	-	2	8	1	2	n
	Very Poor, dangerous at posted speed	-	gilS	ooM	vəS	ıətul	Prec	etx1	Paved	Pavem	Pavement Edge		-		4				$\vdash$		
Payement Dis	Davament Diefrase Manifestation	╀	H			<20	20-50	>50	E E	Paved Sho Separation	Paved Shoulder Separation								_		
	suces mannestation	-	-	2	n	+	2	8	Paved	Cracking	_	L	_			-			$^{+}$		1
	Ravelling	1	-						Partial	Breakup and	and		L						╁		┸
Surface	Flushing	2							Surface	Potholes								117	-		
Defects	Potholes	8	1000000					Г	Treated	Distortion	_		┞		-	+		İ	+		
	Pavement Edge Breaks	4							i	Pavement Edge	nt Edge		Ļ						╁		
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	Noda No. (Sueet) Dixie Road (Regional Road 4)	а Коас	4		۲	Location From	v.=	Sta. 9+500 (Mansion Street)	lansion St	reet)	۵ [	Š	Sta. 9+900 (North Park Drive)	O(No	th Par	Ϋ́	(e)	
Section Length	400 m		(km	(m)(u	ઝ	Survey Date		May 28, 2009	Trat	Traffic Direction	on B	ë ë	B: Both Directions, N: North Bound S: South Bound, E: East Bound, W: West Bound	tions, I	4: North East Bo	Bound und, V	/: Wes	t Boun
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avement Cond	Pavement Condition Rating ( PCR )		75		ž	ding Conc	lition R	Riding Condition Rating (RCR)		7	Eval	Evaluated By	By	Σ.	M. Talukdar, P. Eng.	σ.	Eng.	
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t) Dixie Road (Regional Road 4)	800 m		Pavement Condition Rating ( PCR )	Excellent ( smooth )	8	Good ( confrortable )	Fair ( uncomfortable )		Very Poor, dangerous at posted speed	Pavement Distress Manifestation		Ravelling	Flushing	Potholes	Pavement Edge Breaks	Manholes & Catchbasins	Rippling & Shoving	Wheel Track Rutting	Distortion	Utility Trenches	Longitudinal	Transverse	Pavement Edge Breaks	Мар	Alligator	to the second of the	Distress confinents ( Reffix not covered above)				by Evaluator	Control Position	occupations decreaming report Ref. 1-10-5140
Road No. (Street)	Section Length	Contract No.	Pavement Condi	Ridina	Condition	Rating	( at posted	opeds )		Pavement D			Surface	Defects				Surface	Deformation			:	Cracking			Dietrose Commo	Distress colling			tobu ommood	Accommendation by Evaluator	See Terraprohe	000

Road No. (Street)	it) Dixie Road (Regional Road 4)	onal	Road 4	Œ.		٦,	Location From	rom	Sta. 10+700 (Bovaird Drive)	Bovaird Drive	(6)	To	Sta.	13+750	Sta. 13+750 (Countryside Drive)	yside	Drive	
Section Length	3,050 m			(km)(m)	(m)	S	Survey Date		May 28, 2009	Traffic -	Traffic Direction	<u> </u>	B: Both	Direction th Bound,	B: Both Directions, N: North Bound S: South Bound, E: East Bound, W: West Bound	th Boun	d N: We	st Bou
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Pavement Condi	Pavement Condition Rating ( PCR )			85		ž.	ling Con	dition F	Riding Condition Rating (RCR)	8		Evalu	Evaluated By		M. Talukdar, P. Eng.	lar, P.	Eng.	r
Riding	Excellent ( smooth )			Severity of Distress	مر	Dens (Exter	Density of Distress % (Extent of Occurrence)	ence)	Shou	Shoulder Distress Manifestation	S	Sev	Severity of Distress		Density of Distress, %	y of [	istre	SS,
Rating	Good ( comfortable )									>		Right		Left	Right Left	5	3	Left
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see lellapione	See Tellaplobe Geolechnical Report Ref. 1-10-5140	Yer.	1-10-1	5140					Crack Rout & Coal	P Cool	`	-				1	-	+

Sta. 15+000 (Mayfield Road)	B: Both Directions, N: North Bound S: South Bound, E: East Bound, W: West Bound	connecting Link, A: Major Arterial R: Residential	M. Talukdar, P. Eng.	Density of Distress, %	of Occur	Right Left	20-20 50-20 50-20 50-20	2 3 1 2 3														Extent of		09-009-00 003-00	ız c	L	Manual Spray Patching	Manual Chip Seal	Crack Rout & Seal				
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untryside Drive	Traffic Direction	Class	80	Shoulder Distress	Malliestation		Distress		Pavement Edge	Paved Shoulder Separation	Cracking	Breakup and	Potholes	Distortion	Daviement Edge	Curb Separation				Σ		0	J	<20	-	ng	guir	Patching	eal	2.000	nent	Seal	
Sta. 13+750 (Countryside Drive)	May 28, 2009	-10-5140	Riding Condition Rating (RCR)	Shoulde	Mailli		Dominant TYPE E		Paved	Fell	Paved	Partial	Surface	Treated		Primed							Pavement			Manual Patching	Machine Patching	Manual Spray Patching	Manual Chip Seal	Fog Seal	Surface Treatment	Manual Burn & Seal	0
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Dixie Road (Regional Road 4)	1,250 m		Pavement Condition Rating ( PCR )	10 Excellent ( smooth )	— 8 Good (comfortable)	8 -	Fair ( uncomfortable )	—- 2 View Boar 4	very Poor, dangerous  at posted speed	Pavement Distress Manifestation		Ravelling	Flushing	Potholes	Pavement Edge Breaks	Manholes & Catchbasins	Rippling & Shoving	Wheel Track Rutting	Distortion	Utility Trenches	Longitudinal	Transverse	Pavement Edge Breaks	Мар	Alligator	the form of the	Distress Comments ( Items not covered above)			F. 10. 10. 10. 10. 10. 10. 10. 10. 10. 10	by Evaluator	To the state of	See l'erraprobe Geotechnical Report Ref. 1-10-5140
Road No. (Street)	Section Length	Contract No.	Pavement Conditi	Riding	Condition	Rating	( at posted	sbeed		Pavement Dis			Surface	Defects				Surface	Deformation				Cracking			Dietrose Common	Distress colliller			Docommondation by E. J. L.	Necolimendanon	Coo Torrange	oee lellapione c

Contract No.	Road No. (Street)	t) Dixie Road (Regional Road 4)	onal Road	(4)		ے ا	Location From		. 15+000 (A	Sta. 15+000 (Mayfield Road)	र वि	7	Sta. 1	Sta. 17+064 (North Project Limit)	orth Pr	oject	_imit)		
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Manual Spray Patching  Manual Chip Seal  Fog Seal  Surface Treatment  Manual Burn & Seal	Distress comm	ents ( Items not covere	apove)						Machine Pa	tching			N N	Manual Spray Patching	Patching			+	-
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INCO STRUCTURE	occ leliapione	George Illical Report	Ker. 1-10	7-574					Crack Rout	& Seal						L		-	-

# **APPENDIX D**

TERRAPROBE INC.



CLIENT NAME: TERRAPROBE LIMITED

Certificate of Analysis

5835 COOPERS AVENUE MISSISSAUGA, ONTARIO CANADA L4Z 1Y2 TEL (905)712-5100 FAX (905)712-5122 http://www.agatlabs.com

ATTENTION TO: Rehman Abdul

AGAT WORK ORDER: 09T338709

PROJECT NO: 1-08-3219

SAMPLE TYPE: Soil DATE REPORTED: Jun 29, 2009 O. Reg. 153 Metals & Inorganics in Soil - Table 1 <0.40 10.5 <0.2 <0.3 20.6 <0.2 <0.2 19.5 9.0 0.47 16.7 4.0 39.6 1.33 3.52 136002 <0.40 <0.08 <0.2 0.016 0.9 30.3 11.9 17.6 40.4 <0.2 <0.2 23.9 41.4 15.3 3,5 0.4 9.7 1360020 <0.40 21.0 <0.08 0.013 35.0 <0.3 <0.4 <0.2 23.5 0.710 <0.2 4.2 8.4 DATE RECEIVED: Jun 18, 2009 1360014 <0.40 <0.08 0.022 0.17 <0.2 5.9 27.7 4.0> <0.2 8.19 0.3 6.9 0.3 <0.2 11.6 17.5 2.72 44.6 7.7 0.8 0.2 0.2 0.10 0.2 0.3 0.3 0.3 0.40 0.08 0.011 0.002 0.2 0.2 0.2 0.2 N/A 0.42 210 45 1.2 275 85 120 2.5 43 1.9 9 160 0.23 mS/cm 5/5rd 5/5rd 5/5rd 5/6rd 6/6ri 6/6ri B/Brl b/6d XX DATE SAMPLED: Jun 18, 2009 Soron (Hot Water Extractable) Sodium Adsorption Ratio (2:1) Electrical Conductivity (2:1) Parameter pH, 2:1 CaCl2 Extraction Chromium, Hexavalent Vitrate + Nitrite (2:1) Syanide, Free Chloride (2:1) lolybdenum Chromium /anadium Sadmium **3eryllium** elenium Antimony Arsenic **dercury** Sarium Copper Sobalt lickel Silver

RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to T1(All) Comments:

1360014-1360022 EC, SAR, Chloride & Nitrate/Nitrite were determined on the extract obtained from the 2:1 leaching procedure (2 parts DI water:1 part soil).

pH was determined on the extract obtained from the 2:1 leaching procedure (2 parts 0.01M CaCl2:1 part soil).

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Certified By:

SAI

			Guideline Violation	2	5835 C/ MISSIS	5835 COOPERS AVENUE MISSISSAUGA, ONTARIO
	京区第	Laboratories	S AGAT WORK ORDER: 09T338709			CANADA L4Z 1Y2 TEL (905)712-5100 FAX (905)712-5122
LIENT NAME	ENT NAME: TERRAPROBE LIMITED			ATTENTION TO: Rehman Abdul	http://	http://www.agatlabs.com
AMPLEID	SAMPLE TITLE	GUIDELINE	ANALYSIS PACKAGE	PARAMETER	GUIDEVALUE	RESULT
1360014	1-551	T1(All)	O. Reg. 153 Metals & Inorganics in Soil - Table 1	Chloride (2:1)	330	1710
1360014	1-881	T1(All)	O. Reg. 153 Metals & Inorganics in Soil - Table 1	Electrical Conductivity (2:1)	0.57	2.72
1360014	1-551	T1(All)	O. Reg. 153 Metals & Inorganics in Soil - Table 1	Sodium Adsorption Ratio (2:1)	2.4	44.6
1360020	5-552	T1(All)	O. Reg. 153 Metals & Inorganics in Soil - Table 1	Electrical Conductivity (2:1)	0.57	0.710
1360020	5-552	T1(All)	O. Reg. 153 Metals & Inorganics in Soil - Table 1	Sodium Adsorption Ratio (2:1)	2.4	11.4
1360021	9-551	T1(All)	O. Reg. 153 Metals & Inorganics in Soil - Table 1	Chloride (2:1)	330	292
1360021	9-551	T1(All)	O. Reg. 153 Metals & Inorganics in Soil - Table 1	Electrical Conductivity (2:1)	0.57	1.20
1360021	9-581	T1(All)	O. Reg. 153 Metals & Inorganics in Soil - Table 1	Sodium Adsorption Ratio (2:1)	2.4	15.3
1360022	12-552	T1(All)	O. Reg. 153 Metals & Inorganics in Soil - Table 1	Chloride (2:1)	330	778
1360022	12-552	T1(All)	O. Reg. 153 Metals & Inorganics in Soil - Table 1	Electrical Conductivity (2:1)	0.57	1.33
1360022	12-882	T1(All)	O. Reg. 153 Metals & Inorganics in Soil - Table 1	Sodium Adsorption Ratio (2:1)	2.4	3.52